The USAF
Transformation Flight Plan

FY03-07

HQ USAF/XPXT, Transformation Division

Foreword

U.S. AIR FORCE

The US military is adapting to profound changes in the nature of conflict and the conduct of war brought about by dramatic advances in technology as well as the new international security environment of the post-Cold War. More than ever, the US military must transform to preserve its current advantages, which are in danger of eroding in the face of emerging security threats. It must also shift from a threat-based to a capabilities-based approach to ensure national security.

The Air Force Transformation Flight Plan presents this Service's ongoing transformation to meet these new challenges and shows how it supports the six "Critical Operational Goals of Transformation" described in the 2001 Quadrennial Defense Review. To transform itself to support the vision of global vigilance, reach and power in a changing strategic environment, the Air Force will continue to pursue and adopt new concepts of operation, organizational changes and advanced technologies that significantly improve our warfighting capabilities or the ability to meet the demands of a changing security environment. Changes are required not only in air and space capabilities, but also in how the Air Force *thinks* about war, requiring transformation of our culture, training, and doctrine.

We invite you to join the continuing journey of Air Force Transformation.

John P. Jumper, General, USAF
Chief of Staff

Dr. James G. Roche
Secretary of the Air Force

EXECUTIVE SUMMARY

Introduction

America's Airmen are often sent in harm's way to provide national security and international stability—in recent years, from Desert Storm through Enduring Freedom. We owe it to our Airmen to provide the best resources and tools available to accomplish their vital mission. Continued Air Force transformation is not only essential to achieving this priority, it is mandatory.

The Purpose of the Air Force Transformation Flight Plan

The US military is adapting to profound transformation in the nature of conflict to include the conduct of war brought about by dramatic advances in technology as well as the new international security environment precipitated by the demise of the former Soviet Union. The dangers present in this new environment were most vividly highlighted by the terrorist attacks of 11 September 2001. More than ever, the US military must transform to preserve its current advantages, which are in danger of eroding in the face of emerging security threats. The Air Force Transformation Flight Plan (AFTFP) presents this Service's transformation plan. It addresses OSD requirements for a roadmap that: 1) specifies timelines to develop Service-unique capabilities necessary to meet the Department of Defense's critical operational goals from the 2001 Quadrennial Defense Review; and 2) addresses resource requirements to fully fund transformation through the FYDP (Future Years Defense Program)."

The Flight Plan Outline

The Flight Plan first documents ongoing Air Force transformation and then explains how it helps the Department of Defense (DoD) achieve the six operational goals of transformation articulated in the 2001 Quadrennial Defense Review (QDR).

The Air Force Chief of Staff has established a process to determine future requirements for the Air Force. **Task Force Concepts of Operation** will serve as the focus for transforming our planning, programming, budgeting, requirements, and acquisition processes and describe how the Air Force tailors forces and employs them in a variety of real-world scenarios. Each Task Force will require individual operational concepts, or plans, for how these tasks will be accomplished. Exploring these concepts will further the understanding of the capabilities and responses required to address particular national security challenges. Thus, the Task Forces will provide the basis for determining what future capabilities the Air Force needs to carry out its assigned missions in support of the National Security Strategy. Their identification of the required organizations and capabilities, both transformational and non-transformational, will provide analysis to help prioritize specific programs for funding. The AFTFP is similarly organized.

Chapter I presents the Air Force's broad conceptual view of combat transformation. Chapter II discusses the Air Force goals of transformation articulated in *Air Force Vision 2020* as well as strategic planning and innovation processes currently in place to achieve those goals. Chapter III discusses current Service-wide organizational and cultural transformations to facilitate Air Force transformation. Chapter IV presents the Air Force's new concepts of operation, which describe the requirements the Air Force will soon need. Chapter V details the Concepts of Operation (CONOPS)-derived transformational capabilities along with associated key programs and technologies essential to attaining *Air Force Vision 2020's* goals of transformation. Chapter VI demonstrates how this ongoing Air Force transformation will help DoD achieve the critical transformation goals articulated in the 2001 QDR. Chapter VII looks beyond *Air Force Vision 2020* to transformation challenges in the far-term. Chapter VIII articulates important conclusions about Air Force transformation. Five Appendices provide additional details of these transformation programs and initiatives.

What Is Transformation?

Ongoing rapid advances in technology enable significant increases in military capability that are changing the conduct of warfare. At the same time, the security environment has been changing dramatically since the end of the

Cold War, and the US military must adapt accordingly. Therefore, the Air Force has developed the following definition of the transformation process to address both of these realities:

> ***A process by which the military achieves and maintains asymmetric advantage through changes in operational concepts, organizational structure, and/or technologies that significantly improve warfighting capabilities or ability to meet the demands of a changing security environment.***

Details concerning the Business Transformation were still under development at the time of publication, and so are not included in this document. Business Transformation is a critical part of the larger topic of transformation of the Air Force, and thus it will be addressed in subsequent versions of the Air Force Transformation Flight Plan.

Transformation can be accomplished in various ways: by acquiring new technologies that perform new missions or significantly improving old systems or processes; using existing capabilities in new ways; changing how the military is organized, trained, and equipped; changing doctrine and/or tactics, techniques, and procedures that determine force employment; changing the way forces are led and leaders are prepared; improving how forces interact with each other to produce effects in battles or campaigns; and/or developing new operational concepts.

Some caveats are necessary. First, Air Force transformation does not occur in a vacuum. It must integrate its expanding capabilities with those of the other Services and with non-military elements of national power. Second, it is neither possible, necessary, nor desirable to transform the entire force at once. Transformation may only impact a small percentage of combat forces. Third, transformation does not equal modernization. Transformation enables "significant" improvements, not merely incremental or evolutionary improvement. Fourth, transformation is an ongoing process, not an endpoint. The Air Force has been constantly transforming throughout its history and will continue to do so.

The Goals of the Ongoing Air Force Transformation

Air Force Vision 2020 broadly outlines the goals of transformation. In sum, the Air Force must develop and field capabilities necessary to sustain its core competencies to include necessary command and control through which it employs them in the face of the changing security environment. These core competencies[1] include:

- **Air and Space Superiority:** the ability to control what moves through air and space to ensure freedom from attack and freedom to attack
- **Information Superiority:** the ability to control and exploit information to our Nation's advantage to ensure decision dominance
- **Global Attack:** the ability to engage adversary targets anywhere, anytime to hold any adversary at risk
- **Precision Engagement:** the ability to deliver desired effects with minimal risk and collateral damage to deny sanctuary to the enemy
- **Rapid Global Mobility:** the ability to rapidly position forces anywhere in the world to ensure unprecedented responsiveness
- **Agile Combat Support:** the ability to sustain flexible and efficient combat operations

The Capabilities Review and Risk Assessment (CRRA) is a new business process for reviewing operational resources. This new process is transformational in itself in that we now concentrate on desired battlespace effects vice specific platforms. The capabilities required to achieve these effects will be derived from the Task Force

[1] According to two leading scholars, successful enterprises "consolidate corporate-wide technologies and production skills into competencies that empower individual organizations to adapt quickly to changing opportunities." The 3 identifying characteristics of core competencies are: 1) They transcend a single product or service and provide potential access to a wide variety of markets; 2) they are perceived by customers to deliver significant benefit; and 3) they should be hard to imitate. See C.K. Prahalad and Gary Hamel, "The Core Competence of the Corporation," Harvard Business Review, May-June 1990.

CONOPS, which will be written by operators. In subsequent revisions of the Air Force Transformation Flight Plan, the results of the CRRA process will be described for all of the Task Force CONOPS, which will provide the next level of planning detail beyond the *Air Force Vision 2020* core competencies.

The Transformation Process

Air Force **strategic planning** provides the strategy that forms the foundation of transformation. This strategy results from systematic examination of future demands the Air Force will face as a member of America's total military force. The Transformation Senior Steering Group (TSSG) oversees the evolving Air Force transformation effort. The TSSG will institutionalize the advancements the Air Force has achieved in pursuit of asymmetric advantages, and recognizes the Secretary of Defense's specific emphasis on Transformation. **Constant innovation** lays the groundwork for transformation by identifying new and sometimes revolutionary operational concepts, evaluating the concepts and associated capabilities, and reporting results to the corporate Air Force for decisions on resource allocation or implementation.

Transforming Air Force Culture and Organization

The process of transformation begins and ends with people. To ensure its ongoing transformation, the Air Force must create an environment and a culture conducive to transformation. Then it must change its organization to institutionalize this culture. Several current efforts constitute the backbone of this continuous cultural adaptation:

- **Developing Air and Space Leaders (DAL)** ensures that our officer development programs produce an officer corps fully conversant with our place in a changing world, current in the evolving doctrine of warfare, and proficient in the line specialty for which they were trained
- **Air and Space Expeditionary Force** has transformed the Air Force into a rotation and effects-based force capable of rapidly responding to a variety of threats while accommodating the high operational tempo of today's contingency environment
- The newly created **Deputy Chief of Staff of the Air Force for Warfighting Integration** will focus on the integration of manned, unmanned and space platforms to the benefit of joint, coalition and alliance warfighting. This integration will transform the speed and fidelity of target quality-data to weapons and decision-quality data to commanders. This will in turn close the seams of the Find, Fix, Track, Target, Engage, and Assess (F2T2EA) cycle
- A new organization, the **Directorate of Homeland Security (AF/XOH)** will develop and implement Air Force homeland security responsibilities in support of the newly organized Northern Command
- Air Force implementation of the **Space Commission** recommendations will allow the development of a culture of space-proficient leaders who can operationalize and normalize the use of space
- Through the **Future Total Force (FTF)** effort, the Air Force will transform the way we integrate our Air National Guard, Air Force Reserve and civilian force to produce greater capability more efficiently. To this end, the Air Force is experimenting with new ways to maximize its combat capability via innovative organizational constructs

The Secretary of the Air Force has also emphasized the need to:

> *"Transform while continuing on or moving to a recovery path in critical areas, including morale, quality of life, readiness, infrastructure, procurement, and science and technology."*

This goal has two primary components:

- Recruit, train, and retain a diverse mix of people who reflect the population we serve
- Assure an adequate Quality of Life for Air Force members and their families

Air Force Concepts of Operation

During autumn 2001, with the intent of laying the foundation for the next step in the Air Force's transformation to a capabilities-focused Air Force, the Chief of Staff tasked the MAJCOMs in conjunction with the Air Staff to develop capabilities-based Task Force CONOPS. These Task Force CONOPS are force presentation concepts that describe how the warfighter can use Air and Space Power to counter the strategies and capabilities US forces may encounter in various future scenarios. They will extract the required forces from throughout the Air Force, to include the most ready Air and Space Expeditionary Forces (AEFs), to address scenarios requiring specific responses and capabilities. They will also help identify required capabilities across the entire AF spectrum and will assess which capabilities have shortfalls and, thus, require improvement, development, and transformation. The seven CONOPS under development will not capture every aspect of the Air Force, but will capture all that we do best. As we mature in this process we may add more. A brief description of the AEF CONOPS and each Task Force CONOPS follows:

- **Air and Space Expeditionary Forces CONOPS:** Meets the Air Force requirement to provide Joint Force Commanders (JFCs) with ready and complete air and space force packages that can be tailored to meet the spectrum of contingencies
- **Space and Command, Control, Computers and Communications Intelligence, Surveillance and Reconnaissance Task Force (S&C4ISRTF):** Provides fully integrated manned, unmanned and space forces to focus on a particular area of interest using traditional methods of collection or seamlessly transition to Time Sensitive Targeting in the F2T2EA cycle. It does so by harnessing Air Force capabilities to achieve the horizontal integration of manned, unmanned, air, surface, information and space systems, to provide executable decision-quality knowledge to the commander in near real-time from anywhere.
- **Global Strike Task Force (GSTF):** Rapidly responds to areas where an enemy could attempt to deny access. It combines Stealth, Standoff, Precision, Space and Information with the other services to create the conditions for access.
- **Global Response Task Force (GRTF):** Combines with special operations forces and other services to rapidly respond to incidents of Global Terrorism. Using actionable intelligence for fleeting targets, it combines alert strike platforms based in selected locations with the ability to launch and receive updates en-route to enable rapid response.
- **Homeland Security Task Force (HLSTF):** Orchestrates specific Air Force capabilities as a stand alone force or for use in joint and interagency efforts to effectively prevent, protect against, and respond to a variety of threats to the US homeland
- **Global Mobility Task Force (GMTF):** Organizes the capabilities necessary to provide rapid and effective air mobility support to theater combatant commanders during contingencies. GMTF partners with all the other Task Force CONOPS to cover the full spectrum of operations, from global strike, to Humanitarian Relief Operations/Non-Combatant Evacuation Operations (HUMRO/NEO).
- **Nuclear Response Task Force (NRTF):** Acts as AEF topcover; providing safe, reliable and proficient nuclear forces—the deterrent umbrella under which conventional forces operate—and, if deterrence fails, will execute a variety of nuclear attack options

Key Air Force Transformation Capabilities

In addition to a long list of legacy capabilities, the Air Force believes there are 17 transformational capabilities required to achieve these Task Force CONOPS as well as the *Air Force Vision 2020*.[2] They are capabilities the Air Force cannot achieve today or that must be significantly improved. These capabilities all satisfy the Air Force definition of transformation. The AFTFP organizes these capabilities under the six Air Force core competencies specified in *Air Force Vision 2020* and, where useful, into several subcategories. These 17 transformational capabilities include:

Information Superiority:

[2] These are not the same as the Critical Future Capabilities (CFCs) from the Air Force Strategic Plan and do not replace them. However, many are very similar in nature.

1. Machine-to-machine interface of command and control, intelligence, surveillance, and reconnaissance (C2ISR) systems through the horizontal integration of manned, unmanned, air, surface, information and space systems to provide executable, decision-quality knowledge to the commander in near real-time from anywhere, thereby enabling force application in single-digit minutes from the decision to engage
2. Reliable, secure bandwidth and global data link integration on all air and space platforms with fusion to provide commanders clear, coherent, real time pictures of the global battle space
3. Real-time, deep-look, target-quality information anywhere on Earth that delivers continuous battlespace surveillance, enabling 24/7 time-critical targeting and predictive battlespace awareness
4. Ensured use of the information domain via defensive information warfare (IW)
5. The ability to deny an adversary these same capabilities via offensive IW

Air and Space Superiority:

- ***Overcoming Enemy Air Defenses:***
  6. The ability to conduct 24/7 stealthy operations in order to penetrate and defeat enemy air defenses and clear the path for follow-on forces
  7. The ability to conduct effective and persistent air-to-ground operations beyond the range of enemy defenses under adverse weather conditions, twenty-four hours a day, seven days a week
  8. The ability to destroy high risk, high priority, time-sensitive targets with minimal risk to friendly forces

- ***Space Superiority:***
  9. The ability to protect vital space assets
  10. The ability to deny an adversary access to space
  11. The ability to launch and operate new space vehicles or refuel and repair existing vehicles responsively

- ***Missile Destruction in Flight:***
  12. The ability to detect ballistic missile launches and airborne cruise missiles and destroy both in flight

Precision Engagement:

13. The ability to conduct high volume attacks with significantly fewer platforms
14. The ability to achieve specific, tailored effects on a target, short of total destruction

Global Attack:

15. The ability to attack any target, any place, at any time from anywhere rapidly, precisely, and persistently

Rapid Global Mobility:

16. The ability to rapidly develop and validate Time Phased Force Deployment Data (TPFDD) for any contingency in coordination with theater combatant commanders and rapidly deliver the right forces to the right locations at the right times

Agile Combat Support:

17. The ability to deploy with a significantly reduced forward support footprint

Key Technologies to Enable These Transformational Capabilities

The Air Force has determined that the following major unclassified programs, concepts, and research and development efforts are key to achieving these transformational capabilities (also organized by relevant Air Force core competencies):

Information Superiority: Space Based Radar (SBR), Global Hawk Unmanned Aerial Vehicle (UAV), Automated Intelligence, Surveillance, and Reconnaissance (ISR), Advanced Extremely High Frequency (AEHF) Capability, "Smart Tankers" (KC-X with ISR sensors), Link 16, Combat Information Transport System (CITS), Multi-sensor Command and Control Aircraft and Constellation (MC2AC), Advanced Wideband System (AWS), Joint Tactical Radio System (JTRS), Global Positioning System (GPS) Block IIF/III, Single Integrated Air Picture (SIAP), Air Force Satellite Control Network (AFSCN) expansion

Air and Space Superiority:

- *Overcoming Enemy Air Defenses:*
  - Stealth: F/A-22, F-35A
  - Standoff: Joint Air to Surface Standoff Missile (JASSM), Hypersonic Standoff Weapon (HSSW), Advanced Standoff Cruise Missile (ASCM)
  - Unmanned Combat Air Vehicles (UCAVs): X-45
- *Space Superiority:* Space Operations Vehicle (SOV), Space Maneuver Vehicle (SMV), Evolved Expendable Launch Vehicle (EELV), Defensive Counterspace (DCS), Rapid Attack Identification Detection and Reporting System (RAIDRS)
- *Missile Destruction in Flight:* Space Based Laser (SBL), Airborne Laser, Space Based Infrared System (SBIRS)-High

Precision Engagement: Small Diameter Bomb (SDB), Wide Area Search Autonomous Attack Miniature Munition (WASAAMM)

Global Attack: Common Aerospace Vehicle, Future Strike System (FSS)

Rapid Global Mobility: Advanced Theater Transport (ATT), CV-22, Large Aircraft Infrared Countermeasures (LAIRCM), M-X, and Mobility 2000 (M2K)
Agile Combat Support: Global Combat Support System (GCSS)–Air Force

In addition, there are many additional programs and technologies essential to Air Force transformation associated with the following categories that are either too numerous and/or classified to list in this document:

- Information warfare, such as computer network attack and computer network defense, Electronic Warfare (EW), and psychological operations (PSYOP)
- Advanced ISR for air, space, and ground
- Advanced Command, Control, Communications, and Computers (C4) for air, space, and ground
- Horizontal integration of all Command, Control, Communication, Computer, Intelligence, Surveillance, and Reconnaissance (C4ISR) and weapons platforms
- Robust space surveillance technologies
- Space control systems
- Rapid on-orbit response and servicing of space assets
- Non-lethal weapons
- Directed energy (DE) weapons
- Chemical/biological detection/genomics

Air Force Transformation Addresses QDR's Critical Operational Goals

As Chapter VI demonstrates, Air Force transformation strongly supports the Office of the Secretary of Defense's (OSD) "Critical Operational Goals of Transformation." This brief summary highlights key Air Force efforts that address these goals as articulated in the QDR:

- **Protect bases of operation at home and abroad and defeat the threat of chemical, biological, radiological, nuclear high-yield explosive (CBRNE) weapons:** The Air Force has many programs that support this goal. Efforts to defeat the CBRNE threat are focused on protecting US and friendly forces and civilian personnel while maximizing operational capabilities, including sortie generation, in CBRNE threat environments. Managing the CBRNE threat must be accomplished with a layered offensive and defensive capability. If the adversary's CBRNE capability is severely degraded or destroyed through effective counterforce targeting and strike operations, then the burden placed on missile and ground defense elements is reduced. If missile and ground defense elements are able to deny, divert, or destroy inbound CBRNE attacks, there is less of a burden on nuclear, biological and chemical (NBC) passive defense assets, thereby making it easier for forces to sustain operations in contaminated environments. If CBRNE attacks reach the fixed operating sites, forces must be organized, trained, and equipped to continue mission-critical operations in a complex, but manageable, environment. These elements of offensive strikes, active missile and ground defense, and NBC passive defense operations must work in concert to ensure that the USAF is prepared to operate against adversaries armed with CBRNE.
- **Assure information systems in the face of attack and conduct effective information operations:** The Air Force is pursuing various offensive and defensive IW programs, to include computer network defense, information assurance, computer network attack, EW, and PSYOP. The GSTF and GRTF CONOPS underscore the requirements for offensive IW, and the HLSTF CONOPS requirement to protect "critical infrastructure" encompasses information systems. Notably, most of the factors limiting development of effective IW capabilities are "non-materiel" in nature. Thus, the Air Force has made significant progress by formalizing Information Operations (IO) doctrine and policy and integrating IO into its operational air and space missions. NOTE: Air Force information warfare roughly equates to "information operations" programs in joint parlance, as opposed to Air Force information operations, which includes all "information-in-warfare" activities associated with ISR, weather, and precision navigation and positioning as well as "information warfare."
- **Project and sustain US forces in distant anti-access and area-denial environments:** Many Air Force transformation efforts support this broad objective. It includes GMTF rapid deployment, monitoring adversary anti-access capability development, defeating air defense systems, defeating adversary cruise missiles, enhancing power projection and forcible entry capabilities, defeating long-range means of detection, long-range attack capabilities, protection measures for inter-theater transport aircraft, and efforts to ensure US forces can operate in a chemical/biological environment. Virtually every transformational capability discussed in this document directly addresses some aspect of this objective. The GSTF, GRTF, and GMTF CONOPS also specifically address this objective.
- **Deny enemies sanctuary by providing persistent surveillance, tracking, and rapid engagement:** This objective includes persistent ISR, the capability to find and strike protected enemy forces while limiting collateral damage, manned and unmanned long-range precision strike assets, new small munitions, the ability to defeat hardened and deeply buried targets (HDBTs), UAVs, more numerous precision weapons, and the ability to conduct covert deep insertions over great distances. Additionally, Predictive Battlespace Awareness allows us to know enough about the enemy before hostilities begin enabling our forces to focus our efforts on known areas of interest. Virtually all transformational programs discussed in the AFTFP under the categories of Information Superiority, Precision Engagement, Global Attack, Overcoming Enemy Air Defenses, and Rapid Global Mobility directly address the desired capabilities associated with this broad objective.
- **Enhance the capability and survivability of space systems:** The Air Force is the primary Service charged with achieving this objective. Maintaining space superiority against rapidly increasing threats is key to achieving this goal. Space superiority requires the combined capabilities to: protect our space assets, protect the ground components necessary to operate our space assets, deny an adversary's access to space, quickly launch vehicles into space, and service them on orbit. The Air Force is pursuing numerous efforts in these areas.
- **Leverage information technology (IT) and innovative concepts to develop interoperable joint C4ISR:** There are extensive Air Force efforts to address this critical goal for the US military's ongoing transformation. Of those transformational capabilities most relevant to this QDR goal, the Air Force is developing the following: (1) ISR that provides a complete, accurate, clear, coherent, persistent, real-time picture of the battlespace; (2) the horizontal integration of manned, unmanned, air, surface, information and space systems to achieve the machine-to-machine interface of joint C4ISR systems to provide executable decision-quality knowledge to the commander in near real-time from anywhere; and (3) predictive battlespace awareness.

Future Challenges for Science and Technology

Far-term operational challenges for the Air Force stem from the 2001 congressionally-directed review of Air Force science and technology (S&T) planning. Established by the National Defense Authorization Act of 2001, the review focused on the long-term challenges and short-term objectives that will guide the strategic investment of the Air Force's S&T program and created a process for establishing S&T program directions and priorities to support achieving the objectives of *Air Force Vision 2020*. The six Long-Term S&T Challenge areas for the Air Force are:

- Finding and Tracking—provide quality information from anywhere in near real-time
- Command and Control—monitor, assess, plan, and direct operations anywhere, from anywhere
- Controlled Effects—create precise effects, rapidly, anywhere, any time, for as long as required
- Sanctuary—allow friendly forces to operate anywhere with the lowest risk possible
- Rapid Air and Space Response—respond as quickly as necessary and relocate rapidly
- Effective Air and Space Persistence—sustain force application and supply flow as long as required

Conclusion

The ongoing transformation of the Air Force will significantly enhance its ability to address the anticipated security environment and exploit the current information revolution to profoundly improve the ability to conduct warfare. The capabilities Task Force CONOPS are the basis for how the Air Force will counter future threats and serve as the key for the formulation of a transformation strategy that will strengthen our current advantages and reduce our current limitations, which include:

- Legacy aircraft are becoming more vulnerable to improving modern integrated air defense systems (IADS)
- Defeating an adversary often requires amassing forces in order to win by attrition
- Only a handful of specialized aircraft enjoy the revolutionary advantages of stealth and, then, only at night
- It is very difficult to strike anywhere, anyplace in a timely manner—indeed, it can take days
- Striking an adversary usually requires subjecting aircrews to enemy fire
- Military operations are hindered by untimely, stove-piped C4ISR
- Achieving persistent ISR is frequently not possible
- Military leaders usually lack an accurate, clear picture of the battlespace
- Critical information and space systems are vulnerable to attack
- The United States often cannot persistently strike targets in adverse weather at the time and place of its choosing
- Attacking targets persistently often requires heavy forward presence
- In most cases, the only option to affect a target is to destroy it with bombs
- It is difficult to rapidly deploy forces abroad in a timely manner
- American territory and its forces are highly vulnerable to ballistic and cruise missile attacks

The ongoing Air Force transformation is intended to resolve these shortfalls by enabling the United States to:

- *Conduct network centric warfare to generate significantly increased combat power*
- *Use precision information and selective strike to achieve the effects of mass without massing forces*
- *Achieve air superiority against improving air defenses—to include double digit SAMs--24/7 to clear the path for follow-on forces*
- *Achieve persistent ISR*
- *Gain an accurate, clear common operating picture of the battlespace*
- *Ensure that the right information gets to the right place at the right time*
- *Persistently strike targets 24/7 anywhere in all weather with minimal collateral damage or forward presence and without being subject to enemy fire*
- *Protect critical information and space systems while disrupting and/or destroying those of an adversary*
- *Execute Effects-Based Operations (EBO) to generate the desired effects on a target other than destruction*
- *Rapidly deploy and sustain operations abroad*

- *Defeat airborne ballistic and cruise missiles*

In turn, the ongoing Air Force transformation will:

- *Help achieve interoperable, horizontally integrated joint C4ISR*
- *Enable operations in anti-access/area-denial and urban environments*
- *Counter emerging capabilities which challenge the ability to maintain space superiority*
- *Address the joint and coalition environment*
- *Rapidly move and sustain combat forces anywhere, anytime*
- *Deny sanctuary to our adversaries while protecting our forces and civilians*
- *Greatly reduce friendly casualties and collateral damage*

The Air Force wants its transformation vision to complement those of other Services and DoD. Service-oriented transformational initiatives must ultimately become joint initiatives that provide greater effectiveness for the warfighter. The Air Force is using the Secretary of Defense's construct, expressed by the new defense strategy, the FY03-07 DPG, the QDR and its six operational goals for transformation and risk framework to guide its transformation efforts. Indeed, as the Air Force Transformation Flight Plan discusses, ongoing Air Force Transformation strongly supports the QDR's six critical operational goals of transformation. The Air Force will continue to work with the all the Services, OSD, and the Joint Staff to keep transformation focused and provide the air and space capabilities required for the Nation in a changing security environment well into the 21st Century.

I. INTRODUCTION

America's Airmen are often sent in harm's way to provide national security and international stability. We owe it to our Airmen to provide them with the best resources and tools available to accomplish their vital mission—we want to win the next conflict with a score of 100-0. Continued Air Force transformation is not only essential to achieving this priority, it is mandatory.

The terrorist attacks of 11 September 2001 highlighted the fact that, more than ever, the US military must transform to preserve the advantages it currently enjoys—specifically, its air and space capabilities. Emerging security threats endanger these advantages. The demonstrated superiority of US air and space forces over Afghanistan, and the capabilities they continue to provide the Nation, must not be taken for granted. The Nation and the Air Force must continue to transform to stay ahead of all adversaries.

The Requirement for the Air Force Transformation Flight Plan

The Air Force continues to transform in order to help the U.S Armed Forces maintain broad and sustained advantages over potential adversaries by significantly improving the military capabilities it provides to JFCs. The Air Force is adapting to the dramatic advances in technology as well as the new post-Cold War security environment. The Air Force Transformation Flight Plan (AFTFP) presents this Service's transformation plan. It addresses OSD requirements for a roadmap that: 1) specifies timelines to develop Service-unique capabilities necessary to meet the Department of Defense's critical operational goals from the 2001 Quadrennial Defense Review and 2) addresses resource requirements to fully fund transformation through the FYDP (Future Years Defense Program).

The Flight Plan Outline

To meet this requirement, the AFTFP first describes the ongoing transformation of the Air Force and then explains how those efforts are helping the Department of Defense to achieve the six operational goals of transformation articulated in the QDR.

The Air Force Chief of Staff has established a process to determine future requirements for the Air Force. **Task Force Concepts of Operation** will serve as the focus for transforming our planning, programming, budgeting, requirements, and acquisition processes and describe how the Air Force tailors forces and employs them in a variety of real-world scenarios. Each Task Force will require individual operational concepts, or plans, for how these tasks will be accomplished. Exploring these concepts will further the understanding of the capabilities and responses required to address particular national security challenges. Thus, the Task Forces will provide the basis for determining what future capabilities the Air Force needs to carry out its assigned missions in support of the National Security Strategy. Their identification of the required organizations and capabilities, both transformational and non-transformational, will provide analysis to help prioritize specific programs for funding. The AFTFP is similarly organized.

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Different Views of Transformation

"Transformation" has become a key concept underlying current defense planning efforts. The term, however, means different things to different people. Conflicting definitions have not only confused the issue, but have also led to various widespread misunderstandings about ongoing combat transformation.

Details concerning the Business Transformation were still under development at the time of publication, and so are not included in this document. Business Transformation is a critical part of the larger topic of transformation of the Air Force, and thus it will be addressed in subsequent versions of the Air Force Transformation Flight Plan.

Most articles and discussions that attempt to describe "transformation" fall into two general schools of thought. The first links transformation exclusively with the so-called "revolution in military affairs" (RMA). An RMA is widely described as an order-of-magnitude change in the way the military conducts warfare that renders the status quo obsolete. RMAs combine new revolutionary technology with organizational and conceptual changes that maximize the effectiveness and potential of that technology. RMAs are not dependent on changes in the security environment. Thus, this school tends to have a very strict view of what is actually "transformational."

Proponents of the RMA view of transformation assert that vast leaps in IT capability in the areas of intelligence and surveillance, command and control, and precision weapons delivery have dramatically reshaped warfare. For instance, by linking sensors, communications systems, and weapons systems in an interconnected grid—a concept some call Network Centric Warfare (NCW)—commanders attain decision superiority, providing them with information about an enemy's intentions, capabilities, and vulnerabilities. This capability allows US forces to get inside an adversary's decision cycle and dictate the pace of operations. A warfighting force with mature NCW capabilities enables a commander to see the entire battlespace, identify key centers of gravity of the adversary, and communicate that information to friendly combat forces rapidly, allowing those forces to attack and destroy critical targets with devastating accuracy using precision-guided munitions. This capability has a profound impact on the planning and conduct of war. By massing the right forces at the right point at the right time, a commander can achieve tremendous success with far fewer forces while minimizing attrition. This concept of achieving rapid victory by disabling the enemy's ability to fight as opposed to bleeding the enemy to death via mass attrition has become known as "parallel warfare."

Key to parallel warfare is another concept known as "Effects-Based Operations." This was the foundation for the design of the Gulf War air campaign, and is being further explored in various wargames across DoD. The central idea of EBO is to design campaign actions, based on the desired national security outcomes, rather than merely attacking targets to achieve destruction of adversary forces. It also focuses on combining and coordinating all elements of national power, military and non-military, to achieve goals by affecting the will and perception of the enemy's decision-makers. EBO requires accurate intelligence and the ability to get that intelligence and all other relevant information to the right place at the right time. It also requires the ability to precisely conduct operations in the right order, with a wide range of tools, to include non-lethal weapons and IW.

The other school of thought views transformation more broadly; mainly as changing the US military from a Cold War force to a post-Cold War military prepared to meet the challenges of the new security environment. For them, many transformational efforts that would enable the United States to deal with the new security environment may not be "revolutionary" as described by the RMA school. Put another way, instead of equating transformation with an RMA, this school of thought considers the RMA a subset or category of transformation. In addition, they contend that the RMA would only allow the US military to fight traditional militaries during conventional conflicts in a far more effective way. One of the key characteristics of the new security environment, they argue, is that many of our adversaries probably will not be traditional nation state militaries who will use conventional forces. The key characteristic is that any transformation, whether it is a new technology, concept, organizational change, or some combination of the three, must enable the US military to deal with the post-Cold War security environment effectively.

According to the QDR and the Air Force Strategic Plan, the following are the key characteristics of the post-Cold War security environment that require the US military to transform:

- **Diminished protection of geographic distance**
- **Proliferation of weapons of mass destruction**
- **Increasing challenges from weak/failing states**
- **Unpredictability of conflict locations**
- **Rapidly advancing technologies available to adversaries**
- **Competitions developing in space and information operations**
- **Reduced access to forward bases**
- **More operations in urban areas**
- **The politics of "limited objectives"**
- **Adversaries who generally don't fight to win, but rather fight not to lose**

The proponents of this school of thought argue that future military operations are likely to be "limited" and "unconventional" in nature due, in part, to the nature of likely adversaries, who will increasingly become non-nation states, e.g., terrorists, drug lords, or guerilla groups, etc. This is probably because the need to maintain stability in failed states has greatly increased—prompting the increased demand for peace operations. Additionally, most traditional nation states learned from the Gulf War that it is fruitless to take on the United States in a conventional war. Instead, they may plan a wide array of "asymmetric strategies" to challenge the U.S.—primarily centered on various anti-access strategies to defeat US power projection into distant theaters rather than hoping to deter any US response in the first place. They may also use IW, especially computer network attack and PSYOP, terrorism, and the threat of weapons of mass destruction.

The US military, they argue, must therefore transform to overcome these asymmetric strategies. In addition, it needs to refine its capabilities from that of a blunt instrument of brute, overwhelming force and deterrence to a precise tool of coercion that can carefully achieve strategic control and dissuasion, short of total war, all the while minimizing collateral damage. This necessitates developing means other than dropping bombs to affect targets and compel adversaries.

Both views of transformation make valid points. Whether it comprises an actual revolution or not, ongoing rapid advances in technology are enabling significant increases in military capability that will continue to profoundly change the conduct of conventional warfare. At the same time, the security environment is dramatically different since the fall of the former Soviet Union, and the US military must adapt accordingly in ways beyond the scope of the ongoing RMA.

Air Force Transformation

Therefore, the Air Force has developed the following definition of Air Force transformation that addresses both trends:

> ***A process by which the military achieves and maintains advantage through changes in operational concepts, organizational structure, and / or technologies that significantly improve our warfighting capabilities or ability to meet the demands of a changing security environment.***

"Simply put … it is the leveraging of our technological superiority to create an asymmetric advantage and to combat asymmetric vulnerabilities." –General John P. Jumper, CSAF

The Air Force seeks the seamless integration of manned, unmanned, and space systems. This includes digital machine-to-machine conversations which decrease the F2T2EA cycle by providing the joint warfighter with actionable, decision-quality information. Key to future success is Predictive Battlespace Awareness which allows us to anticipate our adversary's next move even before he makes it. We want to achieve every possible asymmetric advantage over our future adversary.

Several caveats are important:

First, the Air Force has constantly transformed throughout its history as shown by the development of, for example, long-range airpower, jet aircraft, supersonic flight, stealth, spacecraft and servicing, precision-guided munitions, and missiles. True transformation is not the result of a one-time improvement, but a sustained and determined effort across a broad range of areas. Each of these areas has a starting and ending point and is at a different stage of development, but is focused on contributing to and improving the whole. Transformation of the Air Force overall, however, is an ongoing process. The AFTFP provides a "snapshot in time" of all ongoing efforts.

Second, the Air Force believes that meaningful transformation must involve integrating its expanding capabilities with those of the other Services and non-military elements of national power.

Third, combat transformation can be, and usually is, a combination of some or all of the following: new technologies that enable new concepts of operations that are ultimately codified in new organizational arrangements, to perform new missions or significantly improve old systems and processes; the use of existing capabilities in new ways; changes in how the military is organized, trained and equipped; changes in military doctrine or tactics, techniques and procedures that determine force deployment, or determine the way forces are led or interact with each other to produce effects.

Fourth, in the context of combat transformation, it may not be possible, necessary, or desirable to transform the entire US military at once, as some seem to advocate or assume. Historically, transformations involve a relatively small fraction of the force. In addition, so-called legacy forces and their modernization will remain an important component of US military strategy, in the foreseeable future. Also, attempting to transform the entire force at once may be risky—the wrong type of force, totally incapable of meeting actual threats, may be produced. This is especially dangerous in the current security environment, which already includes a wide range of threats.

Fifth, "transformation" is not synonymous with "modernization." Distinguishing between the two, however, is not always easy and is at the heart of the debate over defining transformation. It is important, however, not to group all modernization under transformation. Modernization involves modest, incremental upgrades or improvements to current systems and capabilities or ways to conduct war. Transformation, on the other hand, results in "significant improvements" in warfighting capabilities or in the ability to conduct operations in the post-Cold War security environment that result from new capabilities and/or changes in how the U.S. conducts operations.

Measuring Transformation

Unfortunately, there is no one quantitative metric or framework that allows us to say: "Above this line, a program, concept, or organizational change is transformational and below this line, it is not." Is a technology that gives the military five times more capability in a certain area transformational and one that provides four times more capability not transformational?

This even assumes that transformational capabilities are quantifiable at all. Most metrics assume that transformation only comprises significant improvements in capability. This ignores the fact that many "transformational" efforts are geared to adapting to a post-Cold War security environment, which does not always require improvements in the same capability, but different types of capabilities altogether that are not comparable to the status quo.

Even when a capability is quantifiable, a different metric would need to be developed for each category. For example, measuring the ability to control space is very different from measuring the ability to conduct persistent strikes on a global scale or provide the leaps in combat power enabled by the seamless integration of .our manned, unmanned and space systems.

In the end, determining what is transformational comes down to qualitative judgment calls by informed senior leadership based on a set of agreed standards. In the case of determining what to include in this document, the Air Force first produced a definition of transformation, enhanced by a set of clarifying propositions or caveats. It then reviewed numerous technologies, organizational changes, and concepts and compiled a list of those it felt it could make a compelling case are transformational based on that definition.

The Air Force is trying to tackle the difficult problem of measuring transformation. The Air Force Studies and Analysis Agency (AFSAA) has recently developed a tool based on a concept called Value Focused Thinking (VFT), which makes it possible to measure the multi-objective goals of military transformation. The VFT methodology allows alternative technologies, concepts of operations, and organizational structures to be ranked in terms of contribution to military transformation using the same model. Using sensitivity analysis, transformational alternatives that dominate others and those which are sensitive to satisfying specific objectives can be observed. Alternatives may be ranked in terms of marginal contribution to transformation per dollar cost by dividing the change in transformation by the additional cost of a given alternative, which may be used directly as an input in trade-off analyses. AFSAA will perform the transformational metrics analysis using this and other possible techniques for future presentation.

Why Transform?

The Air Force is transforming by taking advantage of technology that is rapidly evolving to the point that the military would be irresponsible not to exploit it in order to dramatically improve its warfighting capabilities. Even if this were not the case, however, the Air Force must also transform in order both to preserve the advantages the Nation currently enjoys, which are in danger of eroding in the face of new challenges, and to meet the new security threats and environment. As stated by the 2001 QDR, "The purpose of transformation is to maintain or improve US military preeminence in the face of potential disproportionate discontinuous changes in the strategic environment."

II. THE PROCESS OF AIR FORCE TRANSFORMATION

This chapter explains the process used to transform the Air Force of today into the Air Force of the future. This transformational process has two distinct components: strategic planning to provide the general direction and innovation to actually conceive and examine new ideas and turn them into reality.

Strategic Planning–The Foundation of Transformation

Air Force long-range planning builds the strategy that provides the foundation of transformation. This strategy results from systematic examination of future demands the Air Force will face as a member of America's total military force. Producing a clear, long-range vision is the first step in planning. *Air Force Vision 2020*, the Air Force's strategic direction document, sets the strategy for well into the first quarter of the 21st Century. This vision guides the Air Force in developing the air and space capabilities key to meeting national security objectives and realizing the full spectrum dominance envisioned by *Joint Vision 2020*.

Air Force Vision 2020 also broadly outlines the goal of transformation: to sustain the Service's core competencies and the command and control through which they are employed in the face of the changing and emerging security environment through innovation and adaptation. These *core* competencies are:

- **Air and Space Superiority**: *the ability to control what moves through air and space to ensure freedom of action*
- **Information Superiority**: *the ability to control and exploit information to the Nation's advantage to ensure decision dominance*
- **Global Attack**: *the ability to engage targets anywhere, anytime to hold any adversary at risk*
- **Precision Engagement**: *the ability to deliver desired effects with minimal risk and collateral damage to deny sanctuary to the enemy*
- **Rapid Global Mobility**: *the ability to rapidly position forces anywhere in the world to ensure unprecedented responsiveness*
- **Agile Combat Support**: *the ability to sustain flexible and efficient combat operations*

The Capabilities Review and Risk Assessment is a new business process for reviewing operational resources. This new process is transformational in itself in that we now concentrate on desired battlespace effects vice specific platforms. The capabilities required to achieve these effects will be derived from Task Force CONOPS written by operators. In subsequent revisions of the Air Force Transformation Flight Plan, the results of the CRRA process will be described for all of the Task Force CONOPS, which will provide the next level of planning detail beyond the *Air Force Vision 2020* core competencies.

The Air Force Strategic Plan (AFSP) charts the path to achieving the goals of *Air Force Vision 2020* by focusing on critical issues that affect the total force. It does this by melding the guidance of such national and joint planning documents as the *National Security Strategy,* the *National Military Strategy,* and the DPG with *Air Force Vision 2020*. The AFSP describes the framework of the emerging security environment and common planning assumptions at the basis of all Air Force planning. It provides authoritative direction for developing future Air Force capabilities by capturing the strategic direction decisions of senior leadership and identifies the capabilities necessary to prepare the Air Force to meet future demands. It also provides the S&T community with the direction to focus S&T investment.

While *Air Force Vision 2020* provides the general direction, the directives for resource allocation to specific programs are provided in the *Air Force Capabilities Investment Strategy (AFCIS).* AFCIS is a capabilities-based investment strategy designed to attain the Air Force vision. It will provide top-down guidance for planners and programmers for the near, mid, and far-term. It highlights issues that require immediate attention that will meet readiness requirements while transforming the Air Force, re-capitalizing its aging force structure, and continuing to be responsive to the needs of Air Force people.

The *Air Force Transformation Flight Plan* describes Air Force transformation and how it will support DoD in achieving the six QDR transformation goals. The AFTFP is the pragmatic link between the *Air Force Vision 2020* and the AFCIS, turning guidance into planning. Consistent with the AFSP, the AFTFP influences the AFCIS process, helping to establish resource priorities. The Air Force Corporate Structure uses AFCIS to establish funding priorities, ensuring that Air Force planning, programming, and budgeting actions comply with DoD transformation guidance.

Transformation Senior Steering Group

The Chief of Staff and the Secretary of the Air Force in March 2002 chartered a Transformation Senior Steering Group to oversee the evolving Air Force transformation effort. The TSSG will institutionalize the advancements the Air Force has achieved in pursuit of asymmetric advantages, and recognizes the Secretary of Defense's specific emphasis on transformation. By providing oversight to both the combat and business efforts, the TSSG will ensure all Air Force transformation initiatives are coordinated. The Under Secretary of the Air Force and Vice Chief of Staff lead the TSSG, which is comprised of the Headquarters Air Force Deputy Chiefs of Staff and the Major Command (MAJCOM) Vice Chiefs of Staff (when appropriate).

Innovation

The purpose of Air Force innovation is to rapidly assess and implement new ideas, concepts, and technologies so as to field the best capabilities to the warfighter while also improving the associated doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF). Its objective is the timely adoption and integration of new or improved technologies, capabilities, concepts, and processes into Air Force planning and acquisition activities, organizations, and operations. Air Force innovation must be continuous and comprehensive over the near, mid and far-term time horizons.

Sources of Air Force innovation are numerous and come from the most senior leadership all the way down to the most junior Airmen. They come from within the Air Staff, the Secretariat, MAJCOMs, operational units, support organizations, professional military education, academia, S&T research, and the entire defense community. Specific programs often come from lessons learned following a combat operation, where a need for a certain capability or effect was crucial but not available.

Whether a management or operational concept or a new system, it is essential that an advocate champion them to ensure transformation occurs. The Innovation Panel performs this role. The primary purpose of the Innovation Panel is to support the corporate resource allocation process within defined Air Force mission and mission support areas. Its portfolio is a subset of program elements, programs, and activities, such as Battlelabs and S&T that drive, enable, or enhance Air Force innovation. The Innovation Panel does not provide programmatic oversight of the elements in its portfolio. Instead, it uses insight into the elements of its portfolio to generate Air Force-wide assessments and advice.

Technology Development

The Air Force S&T community, which includes the Air Force laboratories and product acquisition centers, supports the innovation process with emerging technologies. This community works closely with operators and strategic planners to explicitly link research activities with the Air Force core competencies and future concepts of operation. Six long-term challenges have been identified to focus Air Force S&T efforts. The challenges are: finding and tracking, command and control, controlled effects, sanctuary, rapid air and space response, and effective air and space persistence. These will be expanded in detail in Chapter VII.

Advanced Technology Demonstrations

Advanced Technology Demonstrations (ATDs) are typically integrated demonstrations that are conducted to demonstrate the feasibility and maturity of an emerging technology. They provide a relatively low-cost approach for assessment of technical risks and uncertainties associated with critical technologies prior to the incorporation of these technologies into a system entering the formal acquisition process. Managed and accomplished by

MAJCOMs, they are significant in leading to solutions that will facilitate a MAJCOM in achieving its mission. Details of the numerous ATDs may be obtained by contacting individual MAJCOMs.

Advanced Concept Technology Demonstrations

Advanced Concept Technology Demonstrations (ACTDs) are designed to respond quickly to an urgent military need. They employ available technologies, which frequently may have been successfully demonstrated in an ATD. Under ACTDs, systems are designed, fabricated, and then demonstrated in realistic combat exercises to gain an understanding of the military utility of the system, to support development of the associated CONOPS, and to place a limited but demonstrated capability into the hands of the warfighter at the conclusion of the ACTD. The Air Force leads several current ACTDs likely to play a significant role in providing transformational capabilities.

Air Force Battlelabs

Focused Battlelabs provide additional emphasis in seven activity areas as Air Force centers of excellence focusing on near-term solutions (2-4 years) to operational issues. The Battlelabs are aimed at our core competencies, both institutionally and operationally. Leveraging ongoing training and exercise investments, the Battlelabs have a direct need for awareness and insight into all of the Air Force Warfare Center's activities. The Warfare Centers lead air and space training exercises and support the operational testing and evaluation of new capabilities. In addition, Battlelabs identify ideas by interacting with Active, Guard, and Reserve forces, foreign military services, other operational and research agencies and industry involved in operations, training, research, testing, acquisition, and logistics. The Battlelabs' ability to freely interact with all these aforementioned agencies is critical to achieve its mission. The Battlelabs draw upon the expertise and resources of Air Force Materiel Command, Air Force Operational Test & Evaluation Center, Air Education and Training Command and other organizations to rapidly generate, lend, or lease technical capabilities needed to demonstrate and measure the worth of promising operational concepts.

Experimentation and Exercises

Air Force experimentation is a discovery process that facilitates achieving the Air Force vision; identifies innovative and revolutionary operations and logistics concepts; evaluates the concepts and associated capabilities; and, provides feedback through the operational innovation process and into the Air Force Corporate Structure. Experimentation focus is on near- to mid-term solutions to operational issues and look at a larger solution scope than the Battlelabs. The Air Force conducts a variety of events and activities to investigate future operational concepts and desired operational capabilities. The Air Force experiments in large-scale field exercises and large-scale field experiments such as Joint Expeditionary Force Experiment (JEFX) that combine live-fly, virtual, and constructive forces in an operationally realistic environment. JEFX applies air and space power in new and innovative ways to enhance Air Force Core Competencies and assess the operational utility of new concepts and capabilities. It also supports requirements, acquisition, and the strategic planning process. Experimentation results, or findings, consist of the best "value added" recommendations for changes in DOTMLPF required to achieve the Air Force vision. Experimentation results illuminate and underpin corporate Air Force modernization decisions. The Air Force experimentation effort also leverages unified command, Joint, DoD, agency, coalition, and private sector experimentation and exercise programs relying heavily on concepts and analyses provided from these programs for its planned, completed, and future events.

Wargaming

Air Force wargames explore concepts, capabilities, and emerging doctrine. They study and refine emerging and future operational concepts and capabilities to promote *Air Force Vision 2020,* to evaluate the AFSP, and to enhance the AFCIS. The Air Force conducts several of its own strategic level wargames and participates in other Service's wargames. Air Force participation in the Army and Navy Title X wargames is intended to highlight how modern air and space power contributes to joint operations. Notably, participation in them explores the potential synergy of emerging Air Force, Army, and Navy concepts. In addition, there are several interagency efforts at varying classification levels that further augment and integrate the unclassified analysis. Wargame scenarios, concepts, and capabilities are enacted in future timeframes.

Recognizing the volatile environment in which today's Airmen find themselves, the Chief of Staff of the Air Force directed that a recurring Air Force wargame, *Global Engagement*, examine the comprehensive application of air and space power. It explores air and space contributions to joint warfighting 10 to 15 years in the future. *Global Engagement* seeks to examine the totality of modern warfare on a level playing field. In a structured forum, military and policy experts highlight, discuss, explore, and define warfighting concepts and issues that can shape the future Air Force.

To explore Air Force innovation 20 or more years into the future, the Air Staff utilizes the *Futures Game*. Set approximately a decade beyond *Global Engagement*, the *Futures Game* works within the context of the Administration's guidance and strategy in order to determine capabilities most able to move the Air Force towards its vision. Proponents of new concepts, capabilities, and emerging doctrine include these innovations in the wargames to evaluate their future potential and raise their visibility. Both *Global Engagement* and the *Futures Game* incorporate all six QDR transformational goals in their play.

III. TRANSFORMING AIR FORCE CULTURE AND ORGANIZATION

The process of transformation begins and ends with people. To ensure ongoing transformation, the Air Force must create an environment and a culture conducive to transformation. Then it must change its organization to institutionalize this culture. Several current efforts constitute the backbone of this continuous cultural adaptation.

Developing Air and Space Leaders

DAL ensures our officer development programs produce an officer corps fully conversant with our place in a changing world; current in the evolving doctrine of warfare and proficient in the line specialty for which they were trained.

The Air Force, as an institution, must develop leaders who encourage innovation and drive the cultural adaptation necessary to realize the potential of transformation. The Air Force must develop leaders fully knowledgeable about unique air and space capabilities and able to employ them throughout the spectrum of operations. Developing Air and Space Leaders spearheads the Air Force initiative to produce leaders who are committed to the advancement, support, employment, and sustainment of air and space power. The Air Force recognizes the value of establishing a more deliberate development system for all Air Force members, one that moves beyond managing careers within functional 'stovepipe' communities. There is a new commitment to a broader process based on institution-wide requirements to produce Air Force members with greater ability to lead in the complex dynamics of the future battlespace.

Junior officers begin as specialists in functional areas for which the Air Force accesses, trains, certifies, and uses them. As the officer progresses, he or she gains knowledge and expertise in a family of similar skills or Core Specialties. Once exposed to broadening experiences, the Core Specialists then become Air and Space Specialists. With the right combination of broadening experiences and familiarities, a Core Specialist can develop into one of the Transformational Leaders. Some Transformational Leaders will fulfill duties as air component commanders and joint leaders. Again, through the right combination of core specialties and broadening experiences, the leaders will be better prepared to succeed in these duties. This will produce a senior leadership with the right blend of functional depth and leadership breadth, leaders with the ability and desire to promote innovative changes to the way the Air Force accomplishes its missions.

To address the universal competencies desirable in all Air Force members, the DAL office works with the Education and Training Review Council, Air University, and the United States Air Force Academy to review the current curriculum against an institutional requirement guidepost. DAL seeks to ensure that the right content and level of instruction is provided to Air Force members at the right point in their careers.

This new leadership development methodology has the potential to create a command climate fostering innovators and senior leaders acclimated to change. Broadening the knowledge and experience base of all Air Force members will expose them to alternative ways of thinking and different ways of solving problems they encounter. It also sets the stage for strengthening the Air Force culture to encourage leaders who are comfortable with change and drive innovative solutions to diverse problem sets.

Initially focusing on officer development, DAL is broadening its scope to include the enlisted corps and civilian team.

Air and Space Expeditionary Force

Air Force reorganization has dramatically changed the service's mindset from a threat-based, forward-deployed force designed to fight the Cold War to a capabilities-based force, based primarily in the Continental United States (CONUS) sufficiently flexible to conduct a wide range of operations throughout the world. The Air and Space Expeditionary Force construct has transformed the Air Force into a rotation and effects-based force capable of rapidly responding to a variety of threats while accommodating the high operational tempo of today's contingency environment.

Deputy Chief of Staff for Warfighting Integration

Warfighters and decision-makers are dependent on information generated and shared across multiple nodes worldwide. Successful joint, coalition and alliance warfighting integration requires an enterprise approach to total information, including people, processes, and technology. This integration will transform the speed and fidelity of target-quality data to weapons and decision-quality data to commanders. To this end, the Chief of Staff of the Air Force recently directed the Headquarters USAF to develop an organization to close the seams between the ability to find, fix, track, target, engage, and assess anything of military significance by greatly improving the integration of manned, unmanned, and space systems. The new organization is the Deputy Chief of Staff of the Air Force for Warfighting Integration.

Directorate of Homeland Security

Another new organization is the Directorate of Homeland Security. AF/XOH stood up on 2 January 2002, under the Deputy Chief of Staff for Operations. Its mission is to develop and implement Air Force Homeland Security (HLS) strategy, lead HLS efforts at the headquarters, and coordinate HLS efforts between the headquarters and the Air Force MAJCOMs. The DPG identified homeland security as the top DoD priority and a key objective for ongoing transformation. AF/XOH will provide the Air Force with a single point-of-contact for the many homeland security organizations (within the Services, the joint staff, OSD, and other Federal agencies) established in the aftermath of the 11 September 2001 terrorist attacks in the other Services, the joint staff, OSD, and other Federal agencies. It will also link Headquarters USAF to the Commander, United States Northern Command.

Space Commission

The changes mandated by the Commission to Assess United States National Security Space Management and Organization, more commonly known as the *Space Commission*, have the potential for far-reaching transformation of defense and intelligence affairs. As the designated the DoD Executive Agent for Space, the Air Force recognizes and embraces the inherent responsibilities to the joint warfighter. Implementing these recommendations will create a more effective and efficient management of joint and national space programs. They will also create a more effective cadre of Air Force space professionals prepared to transform the Service's ability to achieve and maintain space superiority.

Notably, the Air Force is developing a Space Career Management Plan that should be in force before the end of FY02. It will create and sustain a cadre of space professionals to carry space systems from cradle to grave. The plan will address accession, retention, education and training, career path advancement, and methods for developing a space career field that combines research, development, and acquisition, sustainment, operations, and employment.

Future Total Force

Transforming Air Force culture involves not only the active duty forces, but the Air National Guard, Air Force Reserve and civilian forces as well. Thus, the Air Force is experimenting with new ways to maximize its combat capability through innovative organizational constructs integrating the Total Force.

For example, Future Total Force is a transformation initiative to address the challenges facing the Air Force as it enters the 21st Century. The FTF is focused primarily on two general areas: new organizational constructs and new personnel policies. Both are necessary to maintain combat capability and to retain highly qualified personnel to fulfill the Air Force mission. Today's Airman, no matter which component, must think differently and creatively to make the Air Force better. The paradigms of the past no longer apply. Today's personnel—Active Duty, Guard, Reserve, civilian and contractor—work side by side in all types of missions. Integration of the components and effective use of their different types of work status must provide the capability, the experience, the stability, and the continuity required in today's technical air and space force.

To develop the FTF, modeling and analysis were performed to reflect Active, Guard, Reserve and civilian component life-cycle costs and capabilities, to understand and explore manpower composition and organization design at both the unit level and across career fields to promote more efficient and effective personnel utilization.

The Air Force is committed to experimenting with new organizational and functional constructs and developing new personnel policies to maintain capabilities that are integrated, cost efficient, and "good business" to better serve the Air Force and its people.

Transforming While Maintaining Quality of Life

Not only must the Air Force create an environment and a culture conducive to transformation, it must transform while continuing on or moving to a recovery path in critical areas affecting its people, including morale and quality of life. This goal has two primary components:

- **Recruit, train, and retain a diverse mix of people who reflect the population we serve and exhibit the broad skills, intelligence, and personal qualities (consistent with our core values) needed to respond to the dynamic challenges of the 21st century:** This includes emphasizing recruiting efforts across the full spectrum of American society, special pay incentives targeting critical technical skills, aggressively addressing manpower shortages through a "re-recruiting" of people considering separation as well as prior-service personnel. Additionally, we must fund workforce renewal/incentive pay programs to combat significant shortfalls in critically needed career fields, and provide increased educational opportunities for all our members.
- **Assure an adequate Quality of Life for Air Force members and their families:** This includes aggressive investments in Military Family Housing to ensure safe, modern housing; fully funding Medical Health Care Accrual to provide promised and earned lifetime benefits to deserving veterans. We must also invest in essential quality of life programs such as First-Term Airman Centers, Subsidized Childcare, Child Development Centers, Youth Centers, Fitness Centers, Community Centers, Tuition Assistance for Spouses, Federal Employees Health Benefits, and increased coverage for military and civilian moves.

IV. OPERATIONAL CONCEPTS: The Task Force CONOPS

Following CORONA Fall 2001, the Air Force Chief of Staff tasked the MAJCOMs in conjunction with the Air Staff to develop capabilities-based Task Force CONOPS. The intent was to lay the foundation for transformation to a capabilities-focused Air Force. The desired warfighting effects and the capabilities needed to achieve them will drive Air Force transformation. The warfighter will be involved from the very beginning. Task Force CONOPS are force presentation concepts that describe how the warfighter can use Air and Space Power to counter the strategies and capabilities of potential adversaries in a variety of scenarios. They span the types of operations the Air Force may conduct into the foreseeable future. They are not standing task forces, per se, but will extract the required forces from throughout the Air Force, to include the Air and Space Expeditionary Forces most ready to address particular scenarios requiring specific responses and capabilities.

These CONOPS serve a critical role in transforming the Air Force. They assist Air Force leaders in: (1) understanding the warfighting impact of proposed methods of employment, specific capabilities, and potential effects generated; (2) identifying required capabilities; (3) understanding the complex linkage between fielded capabilities/programs and proposed systems/processes; (4) making budgetary and programmatic decisions.

The Capabilities Review and Risk Assessment analyzes and assesses which of the capabilities have critical shortfalls, requiring improvement, and which need development or transformation. Task Force CONOPS also drive a capabilities-based Program Objective Memorandum that will ultimately ensure that combatant commanders have the Air Force resources and combat capability to achieve national military objectives. They will provide a planning framework for future AFCIS and Annual Planning and Programming Guidance.

Task Force CONOPS also will:

- Foster development of innovative air and space power capabilities
- Provide a focus for experimentation in both Service and joint exercises and wargames
- Guide development of future doctrine, tactics, techniques, and procedures
- Give warfighters more influence over planning, programming, requirements, and acquisition processes
- Enable the Air Force MAJCOMs to prioritize investments during their POM submissions

Current Task Force CONOPS include Air and Space Expeditionary Forces, Space and C4ISR, Global Strike, Global Response, Homeland Security, Global Mobility, and Nuclear Response. The details of each vary as they are at different stages of maturity. This chapter briefly summarizes each Task Force CONOPS.

A. Air and Space Expeditionary Forces CONOPS

The AEF CONOPS is the overarching Air Force CONOPS that describes how the Air Force organizes, trains, equips, and presents sustained, combat-ready forces to combatant commanders. It addresses the following two problems that stemmed from the Cold War. First, overseas basing structure evolved within the context of the Cold War with the former Soviet Union, and most bases no longer cover all the places where the U.S. may need to operate. The basing structure is also much smaller, which impacts the ability to deploy and employ. Second, the current AEF structure was designed for force scheduling and is not completely expeditionary in nature. A diminished post-Cold War force was repackaged without the additional resources required for expeditionary operations. Low-density/high-demand assets remain stressed, and existing command and control structures are less than optimum.

The AEF CONOPS provides JFCs with fully capable, rapidly deployable air and space packages that can be tailored to meet the spectrum of contingencies. It will contain the full range of sustainable air and space power and ensure a seamless transition from garrison to expeditionary operations. The Air Force will build and maintain robust AEFs to provide sustained combat power through a rotational schedule that provides reconstitution and training time between vulnerability periods. The result will be a warfighting organization that is organized and equipped to train, deploy, and fight as an expeditionary force.

B. Space and Command, Control, Computers and Communications Intelligence, Surveillance and Reconnaissance Task Force CONOPS

The S&C4ISRTF CONOPS provides fully integrated manned, unmanned and space forces to focus on a particular area of interest using traditional methods of collection or seamlessly transition to Time Sensitive Targeting in the F2T2EA cycle. It does so by harnessing Air Force capabilities to achieve the horizontal integration of manned, unmanned, and space systems, to provide executable, decision-quality information to the commander in near real-time.

This Task Force CONOPS will contribute persistent air, space, and information capabilities to an integrated global surveillance network to alert decision-makers of emerging situations and threats as well as improve Predictive Battlespace Awareness (PBA), which postures decision-makers for effective responses. It is tailored to emerging situations and focuses the full spectrum of C4ISR assets, including Human Intelligence (HUMINT), to support all the combatant commanders' operations. S&C4ISRTF will fuse intelligence and operations people, functions, and systems into a single network to remove the seams between tactical, theater, and national assets, i.e., between the sensor, shooter, and decision-maker. This will enable predictive operations and compress the kill chain across the entire spectrum of operations. It will also enable forces to kill a wide range of mobile, fixed, and fleeting targets.

The bandwidth to support the S&C4ISRTF CONOPS will be great, but the transformational knowledge superiority provided will enable commanders to conduct swift, persistent, global military operations on any scale, anywhere. It will leverage high-speed automated network capabilities to remove the seams between strategic, tactical, global, theater, national, and participating civil assets, i.e., between sensor, shooter, decision-maker, and supporting forces. These will enable the Air Force to: (1) detect and identify any target, anywhere, anytime; (2) defeat anti-access and asymmetric threats such as IW; (3) automate the execution cycle consistent with the JFC's established rules of engagement, but with operators in control and armed with comprehensive battlespace information; and (4) feed and fuse all-source information into a global integrated battlespace picture to enable the command and control of ISR and supporting assets, and the total civil and military force.

C. Global Strike Task Force CONOPS

Potential adversaries have become increasingly reluctant to oppose the US military force-on-force. Instead, they seek new asymmetric ways to counter American strength. For example, potential adversaries are acquiring advanced anti-access systems to threaten and discourage American intervention, disrupt coalitions, and deny access. The GSTF CONOPS will employ joint power-projection capabilities, including stealth, standoff, precision, space and information systems, to rapidly counter adversary anti-access systems and create the conditions required to gain and maintain access for follow-on Joint forces. It will begin prior to conflict by employing persistent, all-weather C2ISR and PBA, as described in the S&C4ISRTF CONOPS, and rapidly deploying forces. At the start of a conflict, it will "kick down the door" into denied battlespace by rapidly degrading, and then defeating, the adversary's C4ISR, anti-access weapons, CBRNE delivery systems and, threats to ground and naval forces, thus, clearing the way for joint persistent follow-on operations. It will also provide the leading edge of coercion to convince enemies to accept US demands.

Prior to conflict, the GSTF CONOPS will employ persistent, all-weather ISR elements, either individually or in a horizontally integrated manner, focused by PBA, to monitor adversary actions; identify, locate, and track targets and threats; and develop and update plans for countering adversary anti-access strategies and capabilities. This will require the capability to: (1) employ secure, survivable ISR from outside the reach of potential adversaries' advanced anti-access threats; (2) employ a mix of low-observable and expendable ISR systems to penetrate adversary space when required; (3) protect air-, surface-, and space-based ISR systems; and (4) conduct detailed threat and infrastructure mapping against potential adversaries with advanced anti-access systems.

In addition, the GSTF CONOPS will require the ability to conduct PBA analysis to locate fixed targets and predict an adversary's probable courses of action. Adversaries are likely to possess advanced, long-range anti-access systems, targeted by advanced C4ISR systems, and will employ mobility, camouflage, concealment, and deception to degrade ISR systems. The threat level may initially require large ISR and command and control (C2) platforms to remain over-the-horizon or in space. Therefore, the GSTF CONOPS will also require the capability to: (1) fuse

joint, coalition, inter-agency, and civil information; (2) employ manned, unmanned, and space assets in an expeditionary sensor constellation to develop and maintain an accurate picture of the battlespace from outside threat range; and (3) conduct over-the-horizon communications and machine-to-machine data exchanges in a hostile electronic environment.

Also prior to conflict, forces must be able to deploy directly from CONUS and forward-based home stations with little or no warning. This will require the capabilities to: (1) rapidly deploy air and space forces into prepared forward bases that allow air-refueled C2ISR and strike systems to reach potential areas of interest and (2) operate with a reduced footprint to minimize basing and force protection requirements. In the initial hours of conflict, the GSTF CONOPS will employ a relatively small number of low-observable and stand-off systems, supported by focused offensive IW and guided by flexible and responsive command and control systems, to gain access into denied battlespace by rapidly degrading, and then defeating, the adversary's C4ISR, anti-access weapons, and CBRNE delivery systems.

The GSTF CONOPS is a transforming concept. It will enable Joint warfighters to improve their ability to collaborate and develop the proper balance between: (1) stand-off, low-observable, human, and expendable sensors; (2) sensor-to-shooter and shooter-as-sensor methods; (3) centralized and decentralized command and control; (4) bandwidth requirements and availability; (5) manned and unmanned platforms; (6) air, surface, and space platforms; (7) kinetic and non-kinetic attack tools; and (8) explosive and directed-energy weapons.

D. Global Response Task Force CONOPS

To combat terrorism, the U.S. must be able to respond swiftly, precisely, decisively, and globally. The GRTF CONOPS is designed to hold terrorist-related targets at immediate risk. Combined with special operations forces and the other services, it will provide an integrated joint air, space, maritime, ground, and information warfare capability to respond globally using precise and decisive force as well as a swift strike capability in an attack window ranging from minutes to hours, based on the fleeting nature of the target. Although the main focus of this CONOPS is counter-terrorism, it may be employed in other situations to support such critical missions as HUMRO/NEO.

Executing the GRTF CONOPS will require: (1) PBA; (2) rapid self deployment, i.e., indigenous lift and refueling support, as well as assets readily available for immediate tasking and properly integrated kinetic and non-kinetic tools; (3) effective command and control for rapid notification and execution as well as secure, jam-resistant, en-route reachback for attack updates and tasking; (4) an infrastructure mix of prepositioned and deployable forces; (5) a coherent battlespace picture; (6) all weather precision standoff strike capability that can strike a full array of fixed and mobile targets from hardened facilities to CBRNE; and (7) a "sneak in the window" force that sets the conditions for persistent operations from follow-on forces when protracted engagement is necessary.

E. Homeland Security Task Force CONOPS

Recognizing that the best defense is a good offense, the primary strategy for the Air Force to defend the homeland is to deter threats from being launched using all means available including offensive action, or, if this fails, to prevent them from reaching their target. In the case of ballistic missiles, cruise missiles, or invading aircraft, armies, or navies, DoD is the lead federal agency for recognizing the attack and has the responsibility for defeating the adversary. For asymmetric threats, the strategy is to root out threats overseas before they manifest themselves in the U.S. In Afghanistan, this was done using Air Force expeditionary capabilities, employed in concert with special operations and ground forces, the Central Intelligence Agency, and Joint aviation. For asymmetric threats that succeed in reaching the US border, a myriad of Federal agencies have the lead responsibility to intercept them, depending upon the medium through which the threat travels. This includes threats traveling by boat, plane, overland, or electronically. DoD is not currently lead federal agency for protecting our borders from crossings that are overwhelmingly benign.

Since preemption cannot be 100 percent successful, the Nation must protect its vital infrastructure both physical and cyber. There are three components: the first is national infrastructure protection, i.e., defending vital civilian infrastructures from attack. The second is critical infrastructure protection, i.e., protecting infrastructure critical to

execution of the National Military Strategy. Central to this is protecting US space assets. The last is force protection, i.e., protecting US military forces from attack, with a particular emphasis on preventing domestic attacks that would preclude overseas deployment of US forces.

Once an attack has occurred, the military may provide consequence management capabilities if requested by a lead agency. This can include, but is not limited to, the use of Air Force airlift assets, mobile emergency medical capabilities, crowd control and fire fighting assets, Explosive Ordnance Disposal teams, and mortuary affairs. Here, the policies, procedures, and capabilities are well defined, although it may be necessary to build up military capabilities to deal with the consequences of a CBRNE attack. Heightened military alertness will also be a consequence of a terrorist attack, requiring security forces and combat air patrols, for example, to guard against further, delayed terrorist activity. These and crisis response activities will occur simultaneously in the near-term aftermath of an attack and must be coordinated with all affected entities. To do so, the Air Force must establish a formal C2 capability, tied into and supporting interagency processes, and providing appropriate connections to state and local governments, and the private sector.

Attribution of the source of a terrorist attack may include information gleaned from military sources. Once sufficient confidence has been reached that the perpetrators have been identified and located, action can be taken. If their location is overseas, DoD will reassume the responsibility to prevent future attacks. If the perpetrators are within the U.S., law enforcement (LE) entities will be used to arrest them, although military forces may provide support, subject to statutory limitations, if the targets are relatively inaccessible and/or heavily armed. Active and Reserve components of the Air Force are involved in each of these mission areas; the Reserve Components acquire this capability by performing their wartime mission and through their role in the communities in which they live and work.

F. Global Mobility Task Force CONOPS

The GMTF CONOPS will provide rapid global mobility, bare basing and base defense in support of the combatant commanders for contingency response, humanitarian relief and evacuation operations. The GMTF enables the GSTF and GRTF to deploy and employ rapidly, anywhere in the world at any time. From movement of combat forces to establishing bases capable of supporting combat operations, GMTF simultaneously follows with sustainment assets to ensure successful execution of the JFC operation. It is unique in its ability to provide rapid global mobility because it leverages the inherent characteristics of air and space power, i.e. speed, flexibility and precision, as well as integrated planning, and advanced C4ISR capabilities to quickly and efficiently deploy, employ and sustain forces across a wide range of situations and environments. Quick, effective response to any crisis/contingency mitigates instabilities, reduce adversaries' time to mobilize threats, reduce casualties to US and allied forces, and limit suffering.

The GMTF is an enabler for the other Task Force CONOPS, and works within the Air & Space Expeditionary Forces CONOPS. Due to the wide-range of operations the GMTF supports, the Task Force CONOPS must devise solutions to developing integrated planning tools and techniques to reduce or eliminate initial planning times, and provide global command and control responsive to real-time ISR. The GMTF CONOPS supports the national strategy of engagement through global power projection across the full spectrum of operations, from global strike, to Humanitarian Relief Operations/Non-Combatant Evacuation Operations.

G. Nuclear Response Task Force CONOPS

In the coming decades, the U.S. will likely face adversaries possessing a wide range of capabilities, to include weapons of mass destruction (WMD) such as CBRNE weapons, which threaten the survival of the U.S. or its allies. These adversaries include those who support terrorists, have active CBRNE programs, and are developing capabilities to reach forward-deployed US forces as well as US and allied population centers. The ability to deter such adversaries, especially those with authoritarian, unconstrained, and unpredictable leaders, is uncertain. While CBRNE threats are not new, the nature of potential adversaries and the methods they may use have dramatically changed. Therefore, the ways the U.S. addresses these threats must transform.

The Congressionally mandated Nuclear Posture Review (NPR), completed in December 2001, put into motion a major change in DoD's approach to the role of nuclear offensive forces in its deterrent strategy and presents a transformational blueprint for a new strategic posture. The NPR established a New Triad composed of offensive strike systems, both nuclear and non-nuclear; defenses, both active and passive; and a revitalized defense infrastructure—all bound together by enhanced command and control and intelligence systems. The addition of defenses and non-nuclear conventional capabilities, combined with IO, will both reduce US dependence on nuclear weapons and improve the ability to deter attack in the face of proliferating WMD. The new capabilities, described in the NPR, reduce the risk to the U.S. as it draws down its nuclear forces toward a goal of 1,700-2,200 operationally deployed strategic nuclear warheads. The NPR also describes the shift from a threat-based planning construct to a capabilities-based planning construct, recognizing the new relationship between the U.S. and Russia following the collapse of the USSR and the end of the Cold War.

A vital element of the New Triad, the NRTF CONOPS fully supports this new joint operational concept by providing safe, reliable and proficient nuclear forces. The conceptual mission of the NRTF is to act as the AEF topcover, providing the deterrent umbrella under which joint conventional forces operate. It helps to deter nuclear attacks and dissuades any adversary from employing nuclear threats to coerce the U.S., its forces, or its allies. It also contributes to deterring other CBRNE attacks, as well as major conventional aggression, that endanger US or allied vital interests. If deterrence fails, the NRTF CONOPS links nuclear strike forces with command, control, information and adaptive planning capabilities to jointly defeat the enemy, through a variety of nuclear attack options, and to reestablish deterrence upon conflict termination. The critical capabilities of the NRTF include joint ISR, joint nuclear command and control; joint nuclear strike forces, strategic and non-strategic; and joint support forces.

V. AIR FORCE TRANSFORMATIONAL CAPABILITIES AND TECHNOLOGIES

Transformation usually combines changes in operational concepts, technologies, and/or organization. The operational concepts characterizing Air Force transformation are driving Air Force requirements, both transformational and non-transformational. Those requirements have associated capabilities the Air Force cannot today achieve or that must be significantly improved to attain the Task Force concepts and the transformational goals of *Air Force Vision 2020*. The Air Force has identified 17 such transformational capabilities.[3] This chapter organizes them and associated key transformational programs under the six Air Force core competencies identified in *Air Force Vision 2020*. Figures 2 through 7 portray the general timelines associated with the key transformational programs discussed in this Chapter. It is important to note that achieving many of these transformational capabilities will require more than the combination of key programs listed here. Many associated programs are too small, numerous, and/or are classified and thus are not included here. Where possible, the chapter groups them into broad categories. Realizing these transformational capabilities will also require the development of relevant DOTMLPF that maximize their transformational potential. The right people must be organized, trained, and supported the right way.

A. Information Superiority

Transformational Capabilities

Currently, information and intelligence often take hours or days to get from sensors to shooters, making time critical and simultaneous targeting very difficult. Battlespace awareness information is often reactive in nature and rapidly loses relevance. Targeting decisions often are made too far away from the warfighter to effectively engage mobile targets. Commanders often do not have a clear, accurate real-time picture of the battlespace. Computer network and information systems are vulnerable to attack. And there is limited ability to disrupt adversary C4ISR assets and information flow.

The following transformational capabilities, when achieved simultaneously, can address these current shortfalls and enable information superiority under most circumstances:

1. **Machine-to-machine interface of C4ISR systems through the horizontal integration of manned, unmanned, air, surface, information and space systems to provide executable, decision-quality knowledge to the commander in near real-time from anywhere, thereby enabling force application in single-digit minutes from the decision to engage**
2. **Reliable, secure bandwidth and global data link integration on all air and space platforms with fusion to provide the commander a clear, coherent, real time picture of the battlespace**
3. **Real-time, deep-look, target-quality information anywhere on earth that delivers continuous battlespace surveillance, enabling 24/7 time-critical targeting and predictive battlespace awareness**
4. **Ensured use of the information domain via defensive information warfare**
5. **The ability to deny an adversary these same capabilities via offensive information warfare**

The benefits of these transformational capabilities are enormous. Information superiority can enable the type of revolutionary change described by RMA advocates in Chapter I. Information superiority allows US forces to identify an adversary's key centers of gravity and relay that information to air and ground forces in near-real time. Combined with precision guided weapons, information superiority allows air and ground forces to attack and destroy the adversary's centers-of gravity simultaneously. This can defeat an enemy by disabling its ability to function rather than by force-on-force attrition warfare.

Even if that effect were not possible, information superiority would also enable the US military to achieve "decision cycle dominance" and allow friendly forces to act and react much more rapidly and effectively than any adversary, obviously creating significant transformational military advantages. While technology will never completely overcome the Clausewitzian "fog of war," achieving information superiority, as described, could certainly minimize

[3] These are not the same as the Critical Future Capabilities from the Air Force Strategic Plan and do not replace them. However, many are very similar in nature.

that fog for US forces and maximize it for the enemy. This result is embodied in the Network Centric Warfare concept.

DoD defines NCW as a "concept of operations that generates increased combat power by networking sensors, decision-makers, and shooters to achieve shared awareness, increased speed of command, higher tempo of operations, greater lethality, increased survivability, and a degree of self-synchronization." This is very similar to various Air Force concepts, such as horizontal integration and machine-to-machine digital interfacing. The Air Force is pursuing several initiatives to demonstrate the warfighting effectiveness these concepts:

- ***Network Centric Collaborative Targeting (NCCT)*** is a network centric operating system designed to horizontally integrate air, space, and surface ISR assets at the digital level. By providing a seamless, machine-to-machine interface, NCCT can dramatically improve geo-location accuracy, timeliness, and combat identification of time sensitive targets. NCCT will ultimately enable a network-centric, distributed processing environment by leveraging existing sensors, communications, and processing systems. NCCT will be particularly useful against elusive time-sensitive targets. The goal is to dramatically reduce the time required to detect, identify, locate, and designate fleeting targets. An ACTD is underway for NCCT and is scheduled for completion in FY05.
- The ***Deployable Theater Information Grid (DTIG)*** is an evolutionary step toward the wide-band, network-based future capability needed to support the air-to-air and air-to-ground communications requirement of the Global Information Grid (GIG). The DTIG is designed to operate as a deployable, mobile information dissemination grid generating increased combat power through information superiority by integrating networks, sensors, decision-makers, and shooters. The DTIG will also enable commanders to dynamically plug and play sensors, engagement systems, weapons, command and control, and support capabilities into task-organized packages across the combat theater.
- ***Time Critical Targeting Functionality (TCTF)*** is a program to provide commanders the manpower and equipment necessary to more effectively strike critical fixed and mobile targets. TCTF combines a network of deployable workstations hosting situational awareness, decision aid, and battle management software applications. These tools incorporate software that predicts enemy courses of action, chooses appropriate targets from a given target set as well as the optimal weapons to attack that target, and re-tasks ISR assets based on real-time ISR information.

Information superiority also yields additional transformational benefits. Because it would enable the U.S. to conduct operations with smaller forces, it would greatly enhance the ability to rapidly deploy forces abroad—which will be key in the post-Cold War security environment. By avoiding the need for massive attrition tactics, information superiority would result in far fewer casualties and collateral damage under most circumstances. Additionally, under the right circumstances, effective offensive IW capabilities, to include computer network attack, EW, PSYOP, military deception, and public affairs operations, could prevent hostilities by influencing adversaries to capitulate before the shooting starts. It also is a critical enabler of time-critical targeting against mobile targets (See Figure 1). Finally, persistent ISR and subsequent PBA capabilities provide the commander with the flexibility to swing assets between theaters as required by the situation and, thus, reduce the number of assets required in theater at one time.

Information superiority, however, cannot be achieved without protecting friendly information, information systems, and information processes. In fact, as the world's most information-dependent fighting force, the US military, must use the defensive IW capabilities of computer network defense, information assurance, operations security, counter-deception, counterintelligence, and counter-propaganda to reduce the ability of adversaries to exploit this reliance on information. By integrating these defensive capabilities to protect or project the commander's objectives and themes, military operations have a much greater chance at success.

Combined, these information superiority capabilities will provide the foundation of the S&C4ISRTF CONOPS, whose goal is to achieve horizontal integration of manned, unmanned, air, surface, information and space systems to provide executable decision-quality knowledge to commanders in near real-time. Information superiority technologies are also essential to achieve the GSTF CONOPS' requirement to employ persistent, all-weather C4ISR and PBA prior to and during conflict. Information superiority is the key enabler of all the Task Force CONOPS. For example, in the initial hours of a conflict, the GSTF CONOPS would use offensive IW, among other tools, to gain access to denied areas and proactively establish an information battlespace friendly to further operations. Similarly, the GRTF CONOPS intends to use offensive IW as a tool to rapidly strike terrorist targets anywhere in

the world. While the HLSTF CONOPS has the requirement for the defense of critical infrastructure including information systems, defensive IW capabilities will be critical to that task.

*Information Superiority Enables **Time Critical Targeting** (TCT)*

The TCT process can be described as a wheel that must be spun in a sequential loop in order to engage targets. The Command and Control Battle Manager must run through this loop in the shortest amount of time possible. The goal is to accomplish the targeting task so that the time from sensor detection to shooter engagement is in single digit minutes. To accomplish this goal, four elements are required to expedite battle management: 1) a shared information environment, 2) robust communications connectivity, 3) automated decision tools, and 4) data links.

The current Joint Force Air and Space Component Commander (JFACC) Planning and Execution Process consists of several phases, to include:

- ***Planning*** for attack operations, including Intelligence Preparation of the Battlespace
- ***Finding, Fixing, and Tracking*** TCTs,
- ***Tasking*** available assets to engage TCTs
- ***Engaging*** the TCT
- ***Assessing*** engagement *results*

A sample future scenario for TCT operations might look like the sequence below:

1. ***Planning***: PBA narrows the JFACC's focus in locating key TCTs
2. ***Find, Fix, Track:*** An intelligence platform(s) with a Moving Target Indicator detects a potential TCT in motion
3. ***Find Fix, Track:*** An Unmanned Aerial Vehicle is redirected to find and validate the target
4. ***Find, Fix, Track****:* Automated Target Recognition (ATR) identifies and tracks the target, now tagged as a TCT
5. ***Find, Fix, Track***: Numerous intelligence assets are integrated with ATR to confirm identity of the target
6. ***Task****:* Attack Operations Decision Aid reviews likely attack options and availability of assets
7. ***Task****:* The Common Operating Picture provides weapon status, TCT weapons coverage, weather status, plus support asset options
8. ***Task-Engage****:* Shooter platforms are assigned the mission and diverted, receiving new target data via data links
9. ***Engage-Assess****:* The attack is monitored by the AOC and other C2 nodes to ensure the process is in accordance with the JFC's priorities and Rules of Engagement
10. ***Assess****:* If onboard assessment is available by shooter, this is relayed to applicable C2 and AOC; if not, other C2 nodes and AOC arrange for post strike assessment

Figure 1, Time Critical Targeting

Transformational Programs

Many of the associated new technologies are not presented here in detail, but they are required to support the transformational capabilities of the programs listed.

Predictive Battlespace Awareness will center around space-based capabilities, air based capabilities, and digitally linking our ISR capabilities. ***Space Based Radar*** and long-range ***UAVs*** (to be stealthy in the future) such as ***Global Hawk*** (production beginning in FY02) will provide the capability to look deeply and persistently into areas that are inaccessible to current platforms due to political restrictions, geographical constraints, or the technological limitations of the legacy systems. The continuous global access of SBR and the extended-loiter capability of the UAV, combined with near real-time data transfer to multiple relevant C2 elements, allow constant imaging or tracking of all relevant mobile or fixed surface targets in any weather conditions. In addition, the ***Automated ISR*** initiative exploits joint service data links such as ***Link 16*** to expand the automated transmission of ISR data to a wide range of users.

The Air Force contribution to achieving the joint horizontal integration of C4ISR and providing the commander a clear, coherent, real-time picture of the battlespace will center on various key systems:

- ***Link 16*** provides jam-resistant, secure communications that can be relayed over long distances for integrated operations and supports the concept of machine-to-machine interface for horizontal integration. It is currently being installed in attack aircraft, beginning with the F-15s and F-16s Block 40/50. The goal is to put Link 16 on all attack aircraft enabling digital interface with C2 aircraft and a variety of joint C2 ground forces.
- ***Distributed Common Ground System (DCGS)*** is a family of systems that will enable the support of multiple, simultaneous, world-wide operations from in garrison and through scalable, modular system deployments.

DCGS will be interoperable with spaceborne, airborne, and surface ISR collection assets and intelligence producers, and it will be able to access intelligence databases from these ISR resources to optimize ISR capabilities. As a key component of the GIG, the DCGS provides the backbone through which disparate ISR assets will be horizontally integrated.

- The Air Force has designated the ***Air and Space Operations Center*** as a weapon system to provide the JFACC a standardized capability to command and control air and space forces. Previously, an AOC used its own unique hardware, software, and servers that were often incompatible with other systems in other AOCs. This action will greatly enhance horizontal integration and provides a much-improved capability to support joint operations with planning, tasking, C2, data fusion, and near real-time common operating pictures of the battlespace. The ***Combined Air and Space Operations Center Experimental (CAOC-X)*** will ensure that the latest new technologies to achieve the capability to provide the commander a clear, coherent, real-time picture of the battlespace are incorporated into the global and theater AOCs in a timely and standardized manner.
- The ***Single Integrated Air Picture*** provides improved air awareness in the battlespace to the warfighter and significantly enhances the Air Force's ability to conduct EBO through the employment of weapons to their designed capability
- ***Advanced Extremely High Frequency*** system will allow secure, jam-resistant, worldwide, satellite-based communications independent of ground relay stations and distribution networks. The first launch is scheduled in 2006.
- The ***Air Force Satellite Control Network*** provides the earth and space connections required to launch, operate, and maintain all military satellites and recover critical warfighter data. It is being expanded over the next ten years to provide DoD-level network assured access from distributed users to and from space assets, with a new dual band capability for the widest compatibility among all DoD space systems.
- The ***Global Positioning System Block IIF and III*** will greatly expand current GPS navigation and targeting capabilities and enhance its jam-resistance in conjunction with anti-jam margins provided by user equipment. First launch of GPS Block IIF is scheduled for 2006 and the Block III for 2009, with the entire constellation expected to remain operational through at least 2030.
- The ***Advanced Wideband System*** will include laser communications crosslinks and satellite downlinks providing previously unavailable communication capability. It will include the ***Laser Communications Terminal (LCT)*** in the system configuration.
- The ***Joint Tactical Radio System***, a program in which the Air Force participates, will provide software reprogrammable joint services radio and data transmission system
- The ***Multi-sensor Command and Control Aircraft (MC2A)*** will provide Ground Moving Target Indicator (GMTI) capabilities, along with focused Air Moving Target Indicator (AMTI) capabilities for Cruise Missile Defense. The aircraft is the hub of the ***Multi-sensor Command and Control Constellation (MC2C)*** that will enable the horizontal integration of ground, air, and space sensors and battle management platforms.
- In the long run, the ***Combat Information Transport System*** will provide a network-centric, fiber-optic system to move, process, and protect all Air Force information

In addition, the Air Force is considering the development of a new aircraft to serve as a tanker and data gateway aircraft—a "***Smart Tanker***." The inherent long endurance of tanker aircraft and the need to deploy large number of tankers make the future tanker force a potentially valuable platform to relay information throughout the theater and thereby play a key role in the horizontal integration of C4ISR. This GSTF enabler connects the line-of-sight Air Force with the beyond-line-of-sight Air Force. Smart Tankers will relay situational awareness and targeting information between Airborne Warning And Control System (AWACS), Joint Surveillance Target Attack Radar System (JSTARS), and AOCs. New capabilities desired include: enhanced multi-role air refueling, multi-boom/hose/drogue, inherent cargo/troop carrying capacity, and an enhanced payload/range capacity.

The Air Force is also developing a wide range of information warfare capabilities in the areas of computer network attack and computer network defense, information assurance, EW, military deception, counter-deception, counterintelligence, public affairs operations, Operations Security (OPSEC), and PSYOP. Many of the details on these capabilities are classified and the individual programs are too numerous to list comprehensively in this document. However, much of the Air Force's current focus in IW is non-materiel. In its inputs to the 2001 QDR, the Air Force highlighted several IW initiatives that will posture the United States to successfully address and defeat the threats of the 2012 timeframe as especially transformational:

- ***Information Warfare Flights (IWF)*:** The USAF trains, equips, and fields units to provide IW combat power to combatant commanders. IWFs provide integrated IW planning capabilities to air and space operations at the

operational and tactical levels for planning and execution monitoring, to include IW support for AEFs. Each IWF includes experts in computer network attack/defense, operational security, military deception, PSYOP, EW, information assurance, counter-intelligence and intelligence who are trained to synchronize the planning and execution of IW actions.

- ***Integrated Information Warfare Training*:** The key to achieving information superiority is to integrate the planning and execution of IW and to develop and foster a robust, trained, and experienced IW workforce. The Air Force has established the only DoD school for advanced hands-on IW training, providing experienced communications, intelligence, counterintelligence, space, information assurance, public affairs, and PSYOP personnel with specialized technical training in IW and IW support. This training must become available to a wider Air Force audience, as well as to the joint warfighter community, through expanded classroom education and training, mobile training teams, distance learning, virtual exercises and experimentation, increased red teaming, etc.
- ***Counterintelligence Support to Network Operations and Security Centers*:** Counterintelligence expertise is needed to recognize threats and mitigate the vulnerabilities of U.S. and allied information and information systems. Critical nodes must be monitored and protected by regional counterintelligence experts to catch and prevent intrusions and ensure the integrity of Air Force information systems.
- ***Enhanced USAF PSYOP*:** PSYOP is an important perception management tool throughout the spectrum of conflict. Psychological preparation of the battlespace permits identification of psychological vulnerabilities, effects-based targeting, and PSYOP measures of merit. Automated tools, increased emphasis on analytical techniques and tools, and improved delivery mechanisms will significantly enhance the effectiveness of Air Force and DoD PSYOP capabilities.
- ***Information Superiority Range*:** A full-spectrum research, development, test, engineering and experimentation range is needed to support transformational changes in the technological environment. It must encompass policies and programs in all mediums of warfare and allow total integration of sensor-to-shooter activities vice mere de-confliction in time. This is the only way to ensure successful development of multi-platform weapons and create an environment for commanders to practice the integration of all ground, maritime, air, space, and information capabilities.

B. Air and Space Superiority

Seven transformational capabilities being pursued support the Air and Space Superiority core competency. They fall into three subcategories: Overcoming Enemy Air Defenses, Space Superiority, and Missile Destruction in Flight.

Overcoming Enemy Air Defenses

In addition to offensive IW capabilities, the Air Force is developing three transformational capabilities to overcome increasingly capable enemy air defenses:

6. **The ability to conduct 24/7 stealthy operations in order to penetrate and defeat enemy air defenses and clear the path for follow-on forces**
7. **The ability to conduct effective and persistent air-to-ground operations beyond the range of enemy defenses under adverse weather conditions, twenty-four hours a day, seven days a week**
8. **The ability to destroy high risk, high priority, time-sensitive targets with minimal risk to forces**

Stealth

Transformational Capabilities

Developing and deploying low-observable or stealthy aircraft is a critical enabler of the GSTF CONOPS' ability to gain entry into denied battlespace by rapidly degrading, and then defeating, the adversary's C4ISR, anti-access weapons, and CBRNE delivery systems. Non-stealthy aircraft are becoming increasingly vulnerable to improving enemy air defense systems. Following operational parameters and employing accurate intelligence, stealthy aircraft can fly largely undetected in hostile airspace and penetrate advanced air defense systems. Stealth usually obviates the need for large force packages, putting far fewer lives and platforms at risk, thus generating far more "bang for the buck." Finally, stealth enables surprise attacks, before an adversary can take precautions.

Transformational Programs

Currently, the Air Force's stealthy fleet is limited to a small silver bullet force of B-2 bombers and F-117s that can only exploit their stealthy qualities at night. The Air Force is operationalizing stealth in its aviation fleet via the F/A-22 and F-35A and enabling stealthy operations in the daylight.

- The ***F/A-22 Raptor*** is critical to enabling the new Defense strategy. The F/A-22's combination of stealth, supercruise, maneuverability, and integrated avionics coupled with improved supportability, represents an exponential leap in warfighting capabilities and allows for the full realization of operational concepts that are vital to the 21st century Air Force. It provides capabilities to the U.S. that no other nation possesses—fulfilling the definition of asymmetry—and as a result, is key to dissuading adversary hostile activity. These transformational capabilities are key to joint, coalition and alliance forces gaining access in the 2010 plus threat environment. It will enhance the joint fight by gaining and maintaining air superiority, thus providing ground, naval and special operations forces with unimpeded access to their targets. It can conduct stealthy operations in the daylight, eliminating threats that restrict current stealth assets to operate at night. The future incorporation of the Small Diameter Bomb will double its precision capacity and result in two-fold increase in effectiveness. With its internal weapons storage, the F/A-22's increased range and maneuverability will allow it to defend itself and protect the F-117 and the B-2, facilitating stealth operations to counter enemy attempts to deny access. Such asymmetric advantages are crucial if the U.S. intends to achieve the air dominance envisioned by the GSTF CONOPS and permit follow-on joint forces freedom to maneuver. The F/A-22 will enable the Air Force to deliver air dominance in any threat environment for decades. The F/A-22 has additional transformational characteristics. First, its ability to "supercruise"-without afterburner- above Mach 1.5 makes it the ideal air-to-ground platform to dramatically shorten the time between finding a rapidly moving target and destroying it—a key "Informational Superiority" transformational capability. The F/A-22 can exploit its stealth and speed to take out critical, highly defended targets at the outset of conflict, especially enemy air defenses armed with advanced surface-to-air missiles (SAMs). This will also significantly improve the US ability to engage cruise missiles. Second, reduced access to forward bases will likely require the U.S. to achieve air superiority with much fewer platforms.
- Once the F/A-22 has established air superiority, more forces can be brought to bear in theater. The ***F-35A***, the Air Force version of the Joint Strike Fighter, with its combination of stealth (albeit not as stealthy as the F/A-22) large internal payloads and multi-spectral avionics, will provide persistent battlefield stealth, to attack mobile and heavily-defended targets and offer vastly increased close-air-support capability to ground forces.
- The Air Force is also developing stealthy unmanned combat aerial vehicles, primarily the ***X-45***

Standoff

Transformational Capabilities

As previously discussed, persistent air-to-ground operations today may require going up against greatly improved IADS. Standoff will provide a means to counter enemy anti-access strategies and enable US aircraft to conduct persistent air-to-ground operations beyond the range of an enemy IADS 24 hours a day and under adverse weather conditions—a huge transformational effect and one that will greatly reduce the number of aircrews and platforms placed in harm's way. Standoff will also be a key enabler of the GSTF CONOPS' ability to operate successfully in heavily defended airspace at the start of a conflict and will often be used by the GRTF CONOPS to conduct rapid response operations against terrorist-related targets.

Transformational Programs

Standoff requires advanced long-range precision weapons.

- A key transformational program is the ***Joint Air to Surface Standoff Missile,*** and its ***Extended Range*** version, ***JASSM-ER***. The JASSM is a stealthy precision cruise missile designed to launch from outside area defenses to kill a wide variety of targets, including hardened targets, both fixed and mobile. It should be available for operational use in 2003. JASSM-ER, scheduled to go into production in 2007, will extend the current production JASSM range from 200 nautical miles to over 500 nautical miles.
- The ***Hypersonic Standoff Weapon*** and the ***Advanced Standoff Cruise Missile*** are long-term future concepts.

Minimizing Risk in Hostile Environments

Transformational Capabilities

In initial phases of conflict against an adversary armed with effective IADS, there will be some select high-risk, high priority time-critical targets whose destruction is essential to defeating the adversary's anti-access strategy and to achieving the GSTF CONOPS' tasks in heavily defended airspace. Currently, lives and very expensive platforms must be risked loitering to accomplish this task. The ability to destroy these high-risk, high priority, time-critical targets with minimal risk is a transformational capability.

Transformational Programs

Unmanned Combat Aerial Vehicles are the key to making this capability a reality. They put no aircrews in harm's way, are not restricted by human physical limitations and can loiter far longer over the battlefield and operate at greatly increased ranges, enabling time-critical targeting of moving targets. The Air Force gained valuable operational experience with baseline UCAV capabilities during Operation Enduring Freedom in Afghanistan.

- The ***X-45*** is the primary UCAV platform currently under development. The stealthy X-45 will be a highly survivable light attack aircraft with selected specific capabilities for lethal and non-lethal suppression of enemy air defenses as well as strike missions. The Air Force is also considering a limited near-term electronic attack capability for the X-45 and studying the longer-term potential to integrate directed energy and precision, all-weather capabilities.

Space Superiority

Transformational Capabilities

Space superiority combines three transformational capabilities:

9. **The ability to protect vital space assets**
10. **The ability to deny an adversary access to space**
11. **The ability to launch and operate new space vehicles or refuel and repair existing vehicles responsively**

Maintaining space superiority comprises one of the most significant operational challenges the U.S. will face into the future. Every operation starting with the Gulf War has powerfully demonstrated the vital importance of space to not only air but also all military operations. Most current military C4ISR depends on satellites worth over $100 billion. The asymmetric advantages these space assets provide are available now because our adversaries lack the equivalent systems and abilities to exploit space. However, this is rapidly changing. To maintain its space superiority, the U.S. must develop ways to protect its space assets, deny use of space to adversaries, and reduce space launch and on-orbit checkout time from weeks/months to hours/days for responsive military space operations. Space superiority is also critical in enabling the integration of C4ISR and PBA required by the S&C4ISRTF and GSTF CONOPS. The part of space superiority focused on protecting space assets is also critical for one mission of the HLSTF CONOPS—the protection of critical infrastructure, which includes ground-based space assets. The remaining Task Force CONOPS will also rely heavily on the space-based C4ISR assets.

Transformational Programs

Key large-scale Air Force programs designed to maintain space superiority include:

- The primary purpose of the ***Evolved Expendable Launch Vehicle*** is to reduce the cost of placing payloads into orbit. Additionally, some transformational aspects of the system include a modular launcher design and standardized payload integration equipment. These transformational aspects, if successfully completed, will provide new options for launch flexibility among payloads that do not exist with today's systems. It will reduce the cost of spacelift by at least 25 percent over current Delta, Atlas, and Titan systems.
- The ***Space Operations Vehicle*** will enable an on-demand spacelift capability with rapid turn-around, multiple standardized payloads, space vehicle maintenance, ISR, and other space missions. It will provide critical offensive and defensive counterspace as well as space surveillance capabilities. The SOV and the EELV will also deploy the Common Aerospace Vehicle.
- The ***Space Maneuver Vehicle*** is a rapidly reusable orbital vehicle deployed from the SOV or EELV that is capable of executing a wide range of space control missions
- The ***Orbital Transfer Vehicle*** will significantly increase flexibility, warfighting utility, and protection of our assets while additionally enabling on-orbit servicing of those assets

- The ***Space Based Laser*** would leverage inherent sensor/pointing capabilities necessary for missile defense and therefore, would be capable of performing space control mission such as space surveillance, offensive counter space, and defensive counter space
- The ***RAIDRS*** is a materiel solution that provides a capability to identify when a space system is under attack. It automatically detects, characterizes, identifies and reports attacks against space systems in near real time. It integrates both non-materiel and materiel capabilities. The architecture extends from sensors on orbit, to the unit level, and to the 14th Air Force Air and Space Operations Center decision center.

The Air Force is also pursuing numerous small and classified programs essential to maintaining space superiority in the following categories:

- Space situational awareness and surveillance
- Space control
- Satellite communications
- Rapid on-orbit servicing and response of space assets, i.e., in hours or minutes
- Microsatellites that would operate cooperatively to perform the function of a larger, single satellite. The employment of microsatellites could make adversary targeting more difficult and allow greater utility and flexibility by permitting the cluster to reconfigure and optimize its geometry for a given mission, enhanced survivability, and increased reliability.
- Various platform defenses and warning gear built into future satellites Key Battlelab initiatives promise to transform our ability to maintain space superiority. Microsatellites, by the use of miniaturization, hold great promise to be able to field orbital systems when and where needed to cover contingencies and augment or replace existing space systems threatened by space-faring adversaries. Advanced launch systems for delivering microsatellites into low-earth orbit will greatly reduce cost and increase responsiveness. Revolutionary carrier interferometry and TCP/IP based satellite command and control systems will increase bandwidth and responsiveness.
- Battlelab initiatives with short-pulse laser technology promise to enhance ISR, Space Control and Force Application with revolutionary new capabilities: imaging through obscurants such as clouds, foliage and camouflage, extending electro-optic use to 24 hours a day through most weather; providing precise range measurements for determining orbital elements of centimeter size objects; producing instantaneous effects such as ablation, shock, spallation and electro-magnetic pulses; and the ability to de-orbit space debris from ground based systems and use in missile defense

Missile Destruction in Flight

Transformational Capabilities

One key component of Homeland Defense, a key transformation objective of the 2001 QDR, as well as the HLSTF CONOPS, is the ability to protect the territorial U.S. It is also essential to protect deployed forces from missile attack. Therefore, the Air Force is pursuing the following transformational capability:

12. The ability to detect ballistic missile launches and airborne cruise missiles and destroy both in flight

Transformational Programs

The Air Force is developing several key programs to achieve this objective:

- A robust ISR network that provides detection, tracking, and warning so US forces can take the necessary actions to ensure force protection and engage missile threats. Part of this ISR architecture is the ***Space Based Infrared System-High***, which will enhance detection and improve reporting of intercontinental ballistic missile (ICBM), sea-launched ballistic missile, and theater ballistic missile (TBM) launches for national and theater missile defense.
- The ***Airborne Laser***, currently under control of the Missile Defense Agency, will use a high-energy laser mounted on a modified 747 aircraft to destroy ballistic missiles in their boost phase
- The ***Space Based Laser*** will offer an initial midcourse discrimination of ballistic missiles as early as 2012, with an eventual boost phase kill capability, preferably over enemy territory, before the threat can reach the U.S.

In addition, the ***F/A-22***, with supercruise, highly capable radar, and horizontal integration with improved external sensors, will enable the US military to target and destroy cruise missiles over a large area of airspace, contributing immensely to effective theater missile defense.

C. Precision Engagement

Transformational Capabilities

Over the past two decades or so, new technology has enabled munitions to strike with incredible accuracy and precision. Before such precision guided munitions (PGMs), the only option to strike a target with air power was to send numerous sorties to drop many bombs with the hope that at least one bomb would hit the target. This put many aircrews at risk, required extensive forward basing, and often resulted in extensive collateral damage around the target. Precision strike capabilities today only require one bomb per aimpoint to destroy it, and the accuracy of the munitions greatly minimizes collateral damage.

The transformational effects of PGMs are obvious. They greatly reduce the number of sorties required to strike a target, the required forward footprint, and the number of aircrews in harm's way. PGMs are also essential during operations that are less than "total war," such as those that prevail in the post-Cold War security environment, which usually require very precise strikes to compel an adversary as opposed to all-out assaults**.**

In addition, PGMs, along with information superiority, are the key components of "parallel warfare," i.e., the ability to mass effects rather than mass forces. Even if the U.S. can identify an adversary's key centers of gravity, rapidly report that to the necessary combat forces, and attack them simultaneously, it still must also have the ability to strike those targets very precisely.

The next steps of this ongoing Precision Engagement transformation involve the following two transformational capabilities:

13. The ability to conduct high volume attacks with significantly fewer platforms
14. The ability to achieve specific, tailored effects on a target, short of total destruction

The dramatic improvement in the number of targets that can be struck per sortie will enable the U.S. to conduct high volume attacks against hundreds of critical targets in the early hours of conflict with a small number of platforms. Achieving effects without destruction will help to minimize collateral damage. At present, the usual option to affect a target is to destroy it with a bomb. This would enable Effects-Based Operations that match precise capabilities to desired effects. These capabilities are critical in the post-Cold War operations that are short of traditional conventional warfare, such as urban and peace operations. Military operations in these environments often require unique weapon system solutions to operate effectively and deliver desired effects while minimizing collateral damage to infrastructure and people.

In the future, the Air Force will be able to match tailored precision weapons to specific types of targets, which will generate effects other than total destruction, including denial of human access to the target, disruption of critical utilities, or neutralization of key target components. An example of this type of capability is the Air Force's ongoing effort to develop and field Agent Defeat Weapons, which are specifically designed to neutralize chemical, biological, radiological, nuclear agents and materials while minimizing collateral effects traditionally associated with high energy weapons.

Transformational Programs

The ability to conduct high volume attacks with significantly fewer platforms will be realized by the following programs:

- The ***Small Diameter Bomb***, a miniaturized munition under development, is scheduled for initial production in 2005. The SDB will enable smaller platforms such as UCAVs[4] to deploy PGMs and increase the F/A-22's

[4] While the X-45 UCAV described earlier has a bay approximately the same size as the F-35A, other UCAVs or converted UAVs will likely have smaller bays or are otherwise unable to deliver current sized PGMs.

effectiveness by enabling it to carry many PGMs internally so it can remain stealthy and perform the transformational capabilities of the GSTF CONOPS.

- The ***Wide Area Search Autonomous Attack Miniature Munition*** will greatly enhance this capability. WASAAMM will be a 31-inch, 85-pound smart missile that can loiter to search for targets. When the target is acquired, WASAAMM can either attack or relay a signal to obtain permission to attack. Due to its very small size, the WASAAMM has stealth qualities.

The ability to achieve specific, tailored effects on a target, short of destruction will be realized with various non-lethal weapons, offensive IW capabilities such as computer network attack and EW, and DE weapons will enable the US military to affect targets without having to destroy them. Two of the primary programs include:

- The ***Advanced Tactical Laser (ATL)*** is a high-energy laser weapon system for precision tactical airborne applications. ATL will provide warfighters with ultra precision and the ability to manage precise effects on an operator's target of choice.
- The ***Active Denial System (ADS)*** employs High Power Microwave (HPM) radiation in the millimeter wave region. This nonlethal antipersonnel weapon transmits energy that is absorbed in the first layers of skin, producing a near-instantaneous, severely painful, sensation. ADS does not cause long-term damage to the targets. Research is ongoing on both land and airborne variants of ADS.
- The ***A-X*** concept is a manned or unmanned platform or systems of platforms that will provide persistent application of tailored precision firepower to defeat, destroy, disperse and deny using lethal and/or non-lethal means. Its utility will be measured by its ability to integrate lethality, connectivity, and survivability through a persistent presence to achieve the desired effects.

One key related tactical-level concept the Air Force is pursuing is the "AC-130 Gunship, Special Tactics (ST), and Unmanned Aerial Vehicle (UAV) Urban Operations" concept. It seeks to achieve precision strike capability in the demanding urban environment by improving ST Combat Control Team maneuverability and survivability to provide more effective terminal attack control/battle damage assessment capabilities. In conjunction, UAVs can fly above and below adverse weather to enhance AC-130 sensor limitations/resolution, and provide ST ground teams with real time, eyes and ears forward, and actionable battlefield information. This concept, coupled with non-lethal AC-130 weapons applications, has the potential to significantly enhance the spectrum of precision effects achievable in urban environments.

D. Global Attack

Transformational Capabilities

A key to achieving DoD's current transformational objective of denying sanctuary to our adversaries is:

15. The ability to attack any target, any place, at any time from anywhere rapidly, precisely, and persistently

This capability is also a key enabler of the GRTF CONOPS' mission of holding terrorist-related targets at risk everywhere. It would also allow the U.S. to project power almost immediately in areas with no forward-deployed forces or easy access. Indeed, the traditional US method of deploying air and ground forces at or through ports and airfields will grow more problematic as national and commercial satellite services, missiles, and WMD technology rapidly evolve. This capability would also buy valuable time should additional forces need to be deployed to the theater.

Bombers such as the B-2, with their long range, stealth, and precision, constitute the initial foray into this capability. For example, with refueling assets, B-2s have operated in Serbia and Afghanistan from bases in the U.S. Ongoing and future improvements will continue to enhance this capability.

Transformational Programs

In the longer term, the Air Force is pursuing several initiatives to execute global attack missions.

- The ***Common Aerospace Vehicle*** is a space delivery vehicle deployed by the SOV and the EELV that will guide and dispense conventional weapons worldwide from and through space within one hour of tasking. It will be able to strike hard and deeply buried targets as well. The Common Aerospace Vehicle's speed and maneuverability combine to make defense extremely difficult.

- Several concept configurations for a ***Future Strike System*** are being studied in an OSD-directed Long Range Strike Study, to be completed in late 2002. The 9-month Aeronautical Systems Center effort will recommend technology investment areas to best support the GRTF CONOPS. The ***Space Based Laser*** can penetrate the atmosphere and strike air and ground targets. It can be reloaded with autonomous refueling vehicles. The ***A-X*** is an effects-based weapon system, evolving from the current gunship. It would provide persistent application of tailored precision firepower to defeat, destroy, disperse and deny an adversary's will or military ability.

E. Rapid Global Mobility

Transformational Capabilities

The number of forward bases and forces, the unpredictable locations of future operations, and rapidly improving anti-access capabilities by likely adversaries require the following:

16. **The ability to rapidly establish an air-bridge and move military capability in support of world-wide combat and humanitarian relief contingencies, including areas with unprepared and/or contaminated airfields**

Such a capability is also critical to the GSTF CONOPS' requirement of being able to employ directly from continental U.S. and forward-bases with little or no warning as well as the GMTF CONOPS' requirement to provide rapid and effective air mobility support to combatant commanders supporting the full spectrum of operations, from global strike to HUMRO/NEO. In addition, several rapid deployment tasks will contribute to the GRTF CONOPS' mission of holding terrorist-related targets at risk with Special Operations Forces (SOF).

Transformational Programs

Achieving these capabilities will be extremely difficult. While the C-17, which is still being procured, will play a critical role, the Air Force is in the process of conducting future mobility studies to help determine the next step. Currently, the Air Force has three transformational programs in this area:

- In the near term, the ***CV-22*****,** with its high speed and unique capabilities, can rapidly insert large numbers of SOF or other small units over long distances
- In the future, the ***Advanced Theater Transport***, which will include super-STOL (Short Take-Off and Landing) or VTOL (Vertical Take-Off and Landing) capability, will provide enhanced payload capacity, including oversized or outsized cargo; extended range; and high-speed/low level adverse weather airdrop capability. It is, however, still in the conceptual stage.
- ***Mobility 2000*** goals are to provide seamless processes and systems with unlimited connectivity from requirements to delivery for the warfighter and other users. M2K will improve safety, velocity, In-transit Visibility, and Mobility Air Force combat capability.

Another aspect of rapid mobility is to ensure that the U.S. can deploy into an area despite improved air defense systems. The development and proliferation of advanced infrared-guided man-portable missiles has greatly increased the danger posed to US aircraft by these relatively low-cost weapons.

The ***Large Aircraft Infrared Countermeasures*** program would defend US cargo, tanker, and other heavy aircraft from attack by antiaircraft missiles. The LAIRCM system incorporates multiple sensors to increase crew warning time following missile launch and it automatically employs countermeasures to defeat the Infrared (IR) missile systems. In the future, should stiff resistance be anticipated, the ***M-X***, a covert transport aircraft with increased speed, range, and agility and capable of undetected infiltration, could be employed.

F. Agile Combat Support

Transformational Capabilities

In addition to new platforms, rapid deployment also includes efforts to minimize the amount of materiel that needs to be deployed. *Air Force Vision 2020* includes a goal to achieve a 50 percent reduction in the forward logistical footprint by 2020. Quite a few transformational platforms, such as the F/A-22, will support this goal by significantly reducing the required forward footprint of our forces. New information and networking technology is enabling "focused logistics," an operational concept articulated in *Joint Vision 2020*. Focused logistics is system

integration technology that enables military forces to be more mobile and versatile by minimizing the amount of logistics "tail" required to conduct combat operations.

17. The ability to deploy with a significantly reduced forward support footprint

This will be essential in achieving the *Air Force Vision 2020's* goal and will also greatly enhance the US ability to rapidly deploy abroad and reduce dependence on forward bases.

Transformational Programs

- The ***Global Combat Support System–Air Force*** will establish a common system architecture to provide the warfighter and supporting elements with timely, accurate, and trusted information, with the appropriate level of security, needed to execute the full spectrum of air and space operations. It is essential to synchronize the combat support systems of mobility air forces and combat air forces so that decision makers will have a clear and comprehensive picture of logistics support. Integration efforts ensuring interoperability between mobility and combat air forces' C2 systems are a critical transformational capability. This will help streamline what the Air Force takes with it during a deployment and increase reachback operations to efficiently sustain units and provide time-definite delivery of needed logistics.

VI. HOW THE AIR FORCE SUPPORTS THE QDR "CRITICAL OPERATIONAL GOALS OF TRANSFORMATION"

The Air Force's ongoing transformation efforts are helping DoD achieve the six "critical operational goals of transformation" articulated in the 2001 QDR. The portions of the QDR presented below in italics show details of these goals. The discussion points to the specific parts of those details that Air Force transformation is addressing and makes references to those relevant transformational capabilities, programs, and CONOPS discussed in the previous chapters instead of repeating all the details. In those cases in which there are additional relevant Air Force efforts not discussed in the AFTFP, this chapter discusses them in more detail. Please refer to Chapter V for more details on specific programs. Please refer to Chapter IV for more details on specific CONOPS.

A. Protect bases of operation at home and abroad and defeat the threat of CBRNE weapons

> *Protecting the American homeland from attack is the foremost responsibility of the US Armed Forces and a primary mission for the Reserve Components. Future adversaries will have a range of new means with which to threaten the United States. It is possible to identify some of these means, including new techniques of terror; ballistic and cruise missiles; weapons of mass destruction, including advanced biological weapons; and weapons of mass disruption, such as information warfare attacks on critical information infrastructure. Others, like those used to attack the United States on September 11, 2001, may be a surprise. Defenses against known and emerging threats must be developed. New approaches to achieving early warning of new threats are a high priority. [Page 30 of QDR]*
>
> *The continued proliferation of ballistic and cruise missiles poses a threat to US territory, to US forces abroad, at sea, and in space, and to US allies and friends. To counter this threat, the United States is developing missile defenses as a matter of priority. Integrating missile defenses with other defensive as well as offensive means will safeguard the Nation's freedom of action, enhance deterrence by denial, and mitigate the effects of attack if deterrence fails. The ability to provide missile defenses in anti-access and area-denial environments will be essential to assure friends and allies, protect critical areas of access, and defeat adversaries. DoD must be prepared to provide near-term capabilities to defend against rapidly emerging threats and more robust capabilities that evolve over time.*
>
> *DoD has refocused and revitalized the missile defense program, shifting from a single-site "national" missile defense approach to a broad-based research, development, and testing effort aimed at deployment of layered missile defenses. These changes in the missile defense program will permit the exploration of many previously untested technologies and approaches that will produce defenses able to intercept missiles of various ranges and in various phases of flight. These defenses will help protect US forward-deployed forces. Moreover, they will provide limited defense against missile threats not only for the American people, but also for US friends and allies. [Page 42 of QDR]*

Efforts to defeat the CBRNE threat are focused on protecting U.S. and friendly forces and civilian personnel while maximizing operational capabilities, including sortie generation, in CBRNE threat environments. Managing the CBRNE threat must be accomplished with a layered offensive and defensive capability. If the adversary's CBRNE capability is severely degraded or destroyed through effective counterforce targeting and strike operations, then the burden placed on missile and ground defense elements is reduced. If missile and ground defense elements are able to deny, divert, or destroy inbound CBRNE attacks, there is less of a burden on NBC passive defense assets, thereby making it easier for forces to sustain operations in contaminated environments. If CBRNE attacks reach the fixed operating sites, forces must be organized, trained, and equipped to continue mission-critical operations in a complex, but manageable, environment. These elements of offensive strikes, active missile and ground defense, and NBC passive defense operations must work in concert to ensure that the USAF is prepared to operate against adversaries armed with CBRNE.

The Air Force is transforming the way it prepares to survive and operate in chemical and biological threat environments by developing and implementing new Counter-Chemical Warfare (C-CW) and Counter-Biological Warfare (C-BW) CONOPS. These CONOPS will enable Air Force commanders to make much more informed risk

mitigation decisions in chemically and biologically contaminated environments, which will lead to increased operational capabilities and maximized sortie generation in these situations. Key transformational Air Force programs that will greatly improve Air Force units' abilities to survive and operate in CBRNE environments include efforts to develop and publish new Counter-NBC doctrine and guidance, developing and implementing the aforementioned C-CW and C-BW CONOPS, and modifying Air Force inspection standards and reporting criteria to enable more detailed and specific accounting for Air Force units' readiness to respond to and operate in chemical and biological warfare environments.

Additionally, the HLSTF CONOPS is driving Air Force planning for missile defense. Key transformational programs that will enable next-generation missile defense capabilities include: SBIRS-High, which would track missile launches, as well as the SBL and ABL to intercept and destroy missiles over enemy territory. More long term, the Air Force is exploring concepts of deploying a "postulated space-based laser system dubbed Evolutionary Aerospace Global Laser Engagement System," which could provide global 24-hour coverage of enemy missile launch sites. In addition, the USAF is developing Agent Defeat weapon systems designed to mitigate the negative collateral effects of a direct strike against chemical or biological agents.

The Air Force is also expanding its anti-terrorism and force protection efforts. The Force Protection Battlelab (FPB) and other Air Force Battlelabs have expanded their foci to identify innovative concepts to combat terrorism and has instituted programs to address physical security, explosive detection and blast mitigation, and chemical and biological detection. The latter programs follow DoD-established standards for decontamination and containment operations to enable continuity of operations in NBC environments. In cooperation with its DoD partners, including the Joint Program Office for Biological Defense, the FPB is experimenting with the next generation package of test equipment and logistics concepts designed to compress the time required to detect the presence of chemical or biological agents from hours to a few minutes to significantly enhance the protection afforded troops in areas susceptible to attack.

The HLSTF CONOPS will integrate Air Force capabilities into joint and interagency efforts to effectively prevent, protect against, and respond to a variety of threats to the homeland. The AEF support elements will have organic force protection capabilities and be capable of defending against conventional air attack and surveillance, deploying robust theater missile defenses, protecting bases against unconventional threats to equipment and personnel, maintaining adequate force protection in high threat environments, and mitigating damage for attacks that get through. The GSTF and GRTF CONOPS will provide the preemptive capability to defeat the threat of CBRNE weapons at their source, thereby allowing the GMTF to rapidly deploy follow-on combat forces to sustain combat operations.

B. Assure information systems in the face of attack and conduct effective information operations

The increasing dependence of societies and military forces on advanced information networks creates new vulnerabilities and opportunities. Potential adversaries could exploit these vulnerabilities through means such as computer network attack and directed energy weapons. The emergence of these new tools of warfare also provides opportunities for non-kinetic attack by US forces. [Page 31 of QDR]

Information operations provide the means to rapidly collect, process, disseminate, and protect information while denying these capabilities to adversaries. Such operations provide the capability to influence perceptions, perform computer network defense and attack missions, conduct electronic warfare, and carry out other protective actions. Information operations represent a critical capability enhancement for transformed US forces.

The QDR highlights both the imperatives for the United States to maintain an unsurpassed capability to conduct information operations, as well as the need to strengthen US capabilities in these areas. DoD must also develop an integrated approach to developing information system requirements, acquiring systems, and programming for the force of tomorrow. The ability to conduct information operations has become a core competency for the Department. [Page 43 of QDR]

The Air Force is developing a wide range of offensive and defensive IW capabilities as part of information superiority. The many details of these programs are classified and the individual programs are too numerous to list. The GSTF, GRTF and GMTF CONOPS underscore the requirements for offensive IW, and the HLSTF CONOPS includes the requirements to protect "critical infrastructure," which includes information systems.

Most of the "limiting factors" to developing effective IW capabilities to address this transformational goal are non-materiel in nature. As little as four years ago, there was no formal Air Force doctrine for IO, no organizational concept for long-term IO support to warfighters, and limited development of IW tools. Today, the Air Force recognizes information as a place, a target, a data element, and a weapon. As a result, the Air Force recognizes the information realm as a round-the-clock combat environment, equal with the air, space, maritime and ground battlespaces. It is developing and integrating the full spectrum of IO activities to achieve information superiority in peace, through crisis, and in war. The Air Force has made significant progress in formalizing IO doctrine and policy and integrating IO into operational air and space missions.

Ongoing Air Force efforts to further develop IW are focused on three areas: (1) normalizing IW in Air Force operations, (2) revitalizing EW, and (3) integrating IW disciplines horizontally to provide greater synergy into all Air Force operations.

1. IW Normalization—The Air Force has several initiatives completed and in progress to operationalize and normalize IW for effective force presentation and warfighting planning/execution. Among them:

- **Policy:** Several Air Force policy documents have been published to guide IW development and operation. The IW CONOPS formalizes the conduct of IW at all levels in the Air Force. The CONOPS provides clear guidance on cross-functional IW support to Joint Forces Air and Space Component and Joint Task Force Commanders.
- **Career Progression:** To ensure field commanders have trained, experienced, mission-ready personnel at the right time, Air Force functional managers have developed standardized methods for managing the growing IW force. The Air Intelligence Agency (AIA), in coordination with Headquarters Air Force and multi-discipline IW community functionals, has established technical training pipelines, career progression guidelines, and classification tools to build and track IW warriors.

2. Electronic Warfare Revitalization: Several initiatives focus on improving Air Force EW capabilities. There is a single office responsible for all EW matters across the Air Force, bringing together previously scattered duties and responsibilities. In summer 2000, a 4-star Air Force summit reviewed and reaffirmed the importance of Air Force EW programs. Action items to address people, equipment, intelligence, ranges and exercises, metrics, organization, future roadmaps, and doctrine issues are in progress. In addition, the Air Force has been fully engaged in the Airborne Electronic Attack Analysis of Alternatives study, and is conducting an EW Long Range Assessment to ensure appropriate EW capabilities are available to meet a full-range of future military requirements.

3. IO Integration: The Air Force continues to bridge and coordinate the interrelated disciplines of IW through revisions to IO doctrine, General Officer steering groups, and force development activities. Among them:

- **Air Combat Command (ACC)/Air Intelligence Agency Integration:** The result is the normalization of IO capabilities as warfighting assets, with a primary objective of enhancing IO force presentation in direct support to the JFC through the Joint Force Air and Space Component Commander/ Commander Air Force Forces
- **AIA Restructure:** AIA was reorganized in 2001. The 67th Information Operations Wing and the 70th Intelligence Wing were realigned under 8th Air Force—the IO warfighting numbered Air Force. Headquarters AIA and its subordinate centers were realigned under Headquarters ACC. The refinement and evolution of these structural changes continues.
- **Air Force IO School:** AIA's 39th Information Operations Squadron runs the IO Integration Course, or IOIC, to train Air Force information warriors in the latest information gain, exploit, attack, and defend methodologies. Graduates from the IOIC are assigned to IO integration positions worldwide, providing IW products and services to field combatant commanders.

C. Project and sustain US forces in distant anti-access and area-denial environments

Future adversaries could have the means to render ineffective much of our current ability to project military power overseas. Saturation attacks with ballistic and cruise missiles could deny or delay US military access to overseas bases, airfields, and ports. Advanced air defense systems could deny access to hostile airspace to all but low-observable aircraft. Military and commercial space capabilities, over-the-horizon radars, and low-observable unmanned aerial vehicles could give potential adversaries the means to conduct wide-area surveillance and track and target American forces and assets. New approaches for projecting power must be developed to meet these threats. [Page 31 of QDR]

The defense strategy rests on the assumption that US forces have the ability to project power worldwide. The United States must retain the capability to send well armed and logistically supported forces to critical points around the globe, even in the face of enemy opposition, or to locations where the support infrastructure is lacking or has collapsed. For US forces to gain the advantage in such situations, they must have the ability to arrive quickly at non-traditional points of debarkation to mass fire against an alerted enemy and to mask their own movements to deceive the enemy and bypass its defenses. Consequently, DoD must carefully monitor attempts by adversaries to develop capabilities that could detect and attack US forces as they approach conflict areas or hold at risk critical ports and airbases with missiles and CBRNE attacks.

The QDR emphasizes the need for new investments that would enable US forces to defeat anti-access and area-denial threats and to operate effectively in critical areas. Such investments will include: addressing the growing threat posed by submarines, air defense systems, cruise missiles, and mines; accelerating development of the Army Objective Force; enhancing power projection and forcible entry capabilities; defeating long-range means of detection; enabling long-range attack capabilities; enhancing protection measures for inter-theater transport aircraft; and ensuring US forces can sustain operations under chemical or biological attack. [Pages 43-44 of QDR]

The Air Force is developing numerous transformational capabilities to address the many capabilities contained in this objective. The QDR guidance on this goal can be summarized into the following required capabilities, which are followed by a short summary of relevant Air Force efforts:

- **Rapid Deployment:** Air Force transformation efforts, discussed in the Rapid Global Mobility section of Chapter V, such as the CV-22 as well as such future concepts as the ATT and M-X, will enhance the ability to arrive quickly to mass fire against an alerted enemy
- **Monitoring adversary anti-access capability development:** This will require a wide range of improved ISR capabilities across the board. The SBR and UAVs will be critical to this goal with their ability to penetrate deep into adversary territory.
- **Defeating air defense systems**: This is addressed squarely in the Overcoming Enemy Air Defenses section of Chapter V. Stealthy platforms such as the F/A-22 can penetrate air defense systems without being seen. Unmanned combat air vehicles such as the X-45 can be used against high-risk, high-value air defense system targets. Standoff capabilities such as the JASSM and the ASCM will enable the U.S. to strike air defense system targets without being subject to their air defenses. In addition, offensive IW capabilities, especially computer network attack and EW, constitute a new effective tool to defeat air defenses as well. The GSTF CONOPS is designed, among other tasks, to defeat air defense systems.
- **Defeat adversary cruise missiles:** Transformational Air Force capabilities to achieve this support are discussed in the Information Superiority, Global Attack, Overcoming Enemy Air Defenses, and Precision Engagement sections of Chapter V. More specifically, they include: (1) interoperable joint C4ISR, which will rapidly locate the targets; (2) global attack capabilities, which will be essential to striking such targets rapidly as they emerge if there are no in-theater assets available; and (3) standoff capabilities, which can strike cruise missile sites in heavily defended airspace. Both the GSTF and GRTF CONOPS are designed, in part, to accomplish this mission.
- **Enhance power projection and forcible entry capabilities:** Virtually all Air Force transformational capabilities described in Chapter V will significantly enhance power projection and forcible entry capabilities. Stealthy capabilities (such as the F/A-22), offensive IW, and UCAVs are at the heart of forcible entry

capabilities. In addition, the capabilities discussed in the enhancing rapid global mobility, standoff, and global attack sections of Chapter V are essential to power projection. Conceptually, both the GSTF and GRTF CONOPS are designed for this purpose.

- **Defeating long-range means of detection**: Air Force transformational efforts include offensive IW and space superiority capabilities to deny space to adversaries
- **Long-range attack capabilities:** The wide range of global attack and standoff capabilities discussed in Chapter V will enable long-range attack capabilities
- **Protection measures for strategic transport and air refueling aircraft:** The LAIRCM program will enhance protection measures for strategic mobility aircraft
- **Ensure US forces can sustain operations under chemical or biological attack:** The Air Force is transforming the way it prepares to survive and operate in chemical and biological threat environments by developing and implementing new counter-chemical and counter-biological warfare CONOPS. These CONOPS will enable Air Force commanders to make much more informed risk mitigation decisions in chemically and biologically contaminated environments, which will lead to increased operational capabilities and maximized sortie generation in these situations. Operational Effectiveness Assessments (OEAs)—modeling and simulation exercises designed to test the impact of a chemical/biological attack on sortie-generation rates—help identify and refine processes to overcome critical weaknesses, thereby optimizing counter-chemical/biological warfare CONOPS effectiveness. Once this "new way of doing business" is implemented across the Air Force, readiness to sustain operations under chemical and biological attack will be maintained through robust NBC defense training, exercise, and inspection programs. Through the Joint NBC Defense Program requirements and acquisition processes, the Air Force is pursuing lightweight, easy-to-use masks and protective suits designed to provide increased protection from chemical and biological agents and is providing operational requirements for real-time chemical and biological detection equipment that will be inexpensive and portable.

The GSTF CONOPS will serve as the initial, leading edge force designed to conduct operations in an intense anti-access environment. It will pave the way for persistent follow-on forces by rapidly rolling back adversary anti-access threats, thereby allowing the GMTF to rapidly deploy follow-on combat forces to sustain combat operations.

D. Deny enemies sanctuary by providing persistent surveillance, tracking, and rapid engagement

Adversaries will also likely seek to exploit strategic depth to their advantage. Mobile ballistic missile systems can be launched from extended range, exacerbating the anti-access and area-denial challenges. Space denial capabilities, such as ground-based lasers, can be located deep within an adversary's territory. Accordingly, a key objective of transformation is to develop the means to deny sanctuary to potential adversaries. This will likely require the development and acquisition of robust capabilities to conduct persistent surveillance, precision strike, and maneuver at varying depths within denied areas. [Page 31 of QDR]

Likely enemies of the United States and its allies will rely on sanctuaries-such as remote terrain, hidden bunkers, or civilian "shields" for protection. The capability to find and strike protected enemy forces while limiting collateral damage will improve the deterrent power of the United States and give the President increased options for response if deterrence fails. Such a capability would not only reduce the likelihood of aggression, but would offer the National Command Authorities the ability to respond immediately in the event of hostilities.

Achieving this objective will require investments in a wide range of cross-Service programs. Investments in intelligence, surveillance, and reconnaissance initiatives must be bolstered. Also emphasis must be placed on manned and unmanned long-range precision strike assets, related initiatives for new small munitions, and the ability to defeat hard and deeply buried targets.

DoD will procure unmanned combat aerial vehicles and intelligence, surveillance, and reconnaissance unmanned aerial vehicles such as Global Hawk. The Department will also increase procurement of precision weapons.

Special Operations Forces will need the ability to conduct covert deep insertions over great distances and will need enhanced C4ISR capabilities to remain in contact with their commanders and to ensure access to real-time intelligence in a number of forms. These capabilities will enable Special Operations Forces to access additional communication, intelligence, and firepower assets in support of their missions deep in hostile environments and to aid in the reduction of friendly losses and casualties. These capabilities will also enhance the strategic and operational agility of Special Operations Forces. [Page 44 of QDR]

This objective asks the Services to develop or improve the following list of capabilities, which are accompanied by brief summaries of key relevant Air Force efforts:

- **Persistent ISR:** The Air Force is pursuing various programs to conduct persistent ISR, which are discussed in the Information Superiority section of Chapter V. Large key programs include the SBR and UAVs.
- **Capability to find and strike protected enemy forces while limiting collateral damage:** Virtually all Air Force capabilities and programs described in Chapter V under the Information Superiority, Precision Engagement, Standoff, and Global Attack will significantly enhance this capability. This will enable the U.S. to strike any target, to include mobile, hard, deeply buried, and information targets, in all weather and all-terrain.
- **Manned and unmanned long-range precision strike assets:** As described in the Global Attack, UCAV and Standoff sections in Chapter V, the Air Force is developing a wide range of global attack, standoff, and unmanned long range strike capabilities
- **New small munitions:** The primary Air Force effort is the GPS-guided Small Diameter Bomb
- **Ability to defeat hardened and deeply buried targets:** Defeating HDBTs will likely require a combination of new, more lethal munitions such as thermobaric weapons that generate highly sustained blast pressures in such confined spaces as tunnels and underground facilities. These munitions release energy over a longer period of time than standard explosives, thereby creating a long-duration pressure pulse when detonated in confined spaces. Also required will be offensive IW capabilities that can cut off power, life support, and other critical services to such targets.
- **UAVs:** The Air Force is developing UAVs such as the Global Hawk and Predator-B
- **Increased procurement of precision weapons:** As described in the Standoff and Precision Engagement sections of Chapter V, the Air Force is developing a wide range of advanced precision weapons and increasing procurement of current PGMs
- **Ability to conduct covert deep insertions over great distances:** In the near-term, the CV-22 is the key platform under development to achieve this objective. In the longer run, the Air Force is examining a concept called the M-X, a covert transport aircraft with increased speed, range, and agility that is capable of undetected infiltration.

The S&C4ISRTF CONOPS will harness Air Force capabilities to achieve horizontal integration of manned, unmanned, air, surface, information and space systems, eventually through machine-to-machine interface of ISR and C2, to provide executable decision-quality knowledge to the commander in near real-time from anywhere. The GRTF CONOPS will provide an integrated joint air, space, maritime ground, and IW capability to respond globally to fleeting targets using precise and decisive force in an attack window ranging from minutes to hours.

E. Enhance the capability and survivability of space systems

In addition to exploiting space for their own purposes, future adversaries will also likely seek to deny US forces unimpeded access to space. Space surveillance, ground-based lasers and space jamming capabilities and proximity microsatellites are becoming increasingly available. A key objective for transformation, therefore, is not only to ensure the US ability to exploit space for military purposes, but also as required to deny an adversary's ability to do so. [Page 31 of QDR]

Because many activities conducted in space are critical to America's national security and economic well being, the ability of the United States to access and utilize space is a vital national security interest. During crisis or conflict, potential adversaries may target US, allied, and commercial space assets as an asymmetric means of countering or reducing US military operational effectiveness, intelligence

capabilities, economic and societal stability, and national will. Ensuring the freedom of access to space and protecting US national security interests in space are priorities for the Department.

The mission of space control is to ensure the freedom of action in space for the United States and its allies and, when directed, to deny such freedom of action to adversaries. As the foundation for space control, space surveillance will receive increased emphasis. DoD will pursue modernization of the aging space surveillance infrastructure, enhance the command and control structure, and evolve the system from a cataloging and tracking capability to a system providing space situational awareness.

In recognition of the high-technology force multipliers provided by space systems, the QDR places increased emphasis on developing the capabilities to conduct space operations. Ensuring freedom of access to space and protecting US national security interests are key priorities that must be reflected in future investment decisions. [Page 45 of QDR]

The Air Force is the primary Service charged with achieving this objective. Achieving space superiority is an essential component of this objective. Space superiority combines the following three capabilities: protect space assets, protect the ground components necessary to operate our space assets, deny an adversary's access to space, and quickly launch vehicles and operate payloads into space. As described in Chapter V in the Space Superiority section, the Air Force is very active in developing the key capabilities required to maintain space superiority against improving threats.

Many Air Force efforts are classified. Among the unclassified key programs, the SOV and SMV will be critical in executing various space control missions. In addition, many space assets under development are utilizing much improved defensive systems such as anti-jam technology. Also, various IW programs under development would contribute greatly to this QDR objective. A set of programs collectively called "Space Control Systems" will provide critical capabilities.

Satellite protection will be greatly enhanced through various situational awareness and space control technologies, rapid on-orbit response of space assets in hours or minutes, and, potentially, through the use of microsatellites that will operate cooperatively to perform the function of a larger, single satellite. The employment of microsatellites could make adversary targeting more difficult and will allow greater utility and flexibility by permitting the cluster to reconfigure and optimize its geometry for a given mission, enhanced survivability, and increased reliability. Various platform defenses and warning gear built into future satellites will also contribute to the protection and overall survivability of US space assets.

F. Leverage information technology and innovative concepts to develop interoperable Joint C4ISR

Finally, new information and communications technologies hold promise for networking highly distributed joint and combined forces and for ensuring that such forces have better situational awareness—both about friendly forces as well as those of adversaries—than in the past. Information technology holds vast potential for maximizing the effectiveness of American men and women in uniform. [Page 31 of QDR]

Information technology will provide a key foundation for the effort to transform US armed forces for the 21st century. The recent US experience in Kosovo underscored the need for high-capacity, interoperable communications systems that can rapidly transmit information over secure, jam-resistant datalinks to support joint forces. In the near future, the United States must also develop alternatives capable of overcoming current and projected bandwidth constraints. The Department must stay abreast of the new communications landscape and leverage it to maximize US advantages in this area.

Future operations will not only be joint, but also include Reserve Components, civilian specialists, and other federal agencies and state organizations. Most likely they will involve a coalition effort with other countries. The effectiveness of these operations will depend upon the ability of DoD to share information and collaborate externally as well as internally. Interoperability, which enables joint and combined operations, is a key element in all DoD operational and systems architectures. It must include the ability to

overcome language and cultural barriers. Experience shows that fixing systems after the fact to achieve interoperability is typically costly and often fails to satisfy mission requirements and creates security problems. The better approach is to incorporate interoperability at the outset in designing new systems. However, the Department will continue its efforts, where cost effective, to bring its legacy systems up to interoperability standards.

Based on QDR deliberations, funding will be focused on achieving end-to-end Command, Control, Communication, Computer, Intelligence, Surveillance, and Reconnaissance capabilities. An integrated joint and combined C4ISR capability is necessary to ensure that accurate and relevant information can be gathered swiftly from various sources and then securely transmitted to forces and their commanders. Improving communications must be a priority for US conventional, special operations, and strategic forces. Information technology offers US forces the potential of conducting joint operations more effectively, with smaller forces and fewer weapon systems. [Pages 45-46 of QDR]

All of the Air Force transformation efforts to obtain information superiority, as detailed in Chapter V, address this critical goal, which is at the center of the US military's ongoing transformation. Of those transformational capabilities, those most relevant to this QDR goal are: (1) ISR that provides a complete, accurate, clear, coherent, persistent, real-time picture of the battlespace; (2 the horizontal integration of manned, unmanned, air, surface, information, and space systems to achieve the machine-to-machine interface of joint C4ISR systems to provide executable decision-quality knowledge to the commander in near real-time from anywhere; and (3) PBA.

Key Air Force programs from Chapter V that address this objective include: SBR, SBIRS, Global Hawk UAV, Automated ISR, AEHF Capability, "Smart Tankers", CITS, Multi-sensor Command and Control Aircraft and Constellation, AWS, DCGS, JTRS, GPS Block IIF/III, CAOC-X, SIAP, and AFSCN expansion. In addition, there are numerous small and/or classified Air Force programs also essential to achieving this goal. They can be classified in the following general categories: offensive and defensive IW, such as computer network attack and defense, EW, and PSYOP; advanced ISR for air, space, and ground; advanced C4 for air, space, and ground; and the horizontal integration of all C4ISR and weapons platforms.

The S&C4ISRTF CONOPS is the primary concept driving the requirements of these systems. In addition, the GSTF CONOPS includes extensive details and guidance regarding the types of capabilities required to achieve this QDR goal.

VII. LONG-TERM TRANSFORMATION:
Future Challenges for Science and Technology

Far-term operational challenges for the Air Force stem from the 2001 congressionally directed review of Air Force S&T planning. Established by the National Defense Authorization Act of 2001, the review focused on the long-term challenges and short-term objectives that will guide the strategic investment of the Air Force's S&T program and created a process for establishing S&T program directions and priorities to support achieving the objectives of *Air Force Vision 2020*.

With regard to basic research, the S&T portfolio must be as robust as possible because of the difficulty of predicting which research elements will bear fruit. As many places as possible must be explored to avoid missing the technology that could provide "leap-ahead" capability.

Long-Term Challenges

The "Long-Term Challenges", or LTCs, were developed by integrated product teams with representatives from the Air Force operations, planning and research communities, tasked to consider the capabilities the Air Force would need to have in the period of 2020-2050. Although the results are relevant to near-term efforts such as the Task Force CONOPS and the QDR transformation goals, they were primarily intended to be an independent look at the far future. The LTCs are deliberately expressed in broad terms to avoid specifying solutions that could limit the exploratory nature of future S&T research. The six LTCs are:

- **Finding and Tracking:** *provide quality information from anywhere in near real-time*
- **Command and Control:** *monitor, assess, plan, and direct operations anywhere, from anywhere*
- **Controlled Effects:** *create precise effects, rapidly, anywhere, any time, for as long as required*
- **Sanctuary:** *allow friendly forces to operate anywhere with the lowest risk possible*
- **Rapid Air and Space Response:** *respond as quickly as necessary and relocate rapidly*
- **Effective Air and Space Persistence:** *sustain force application and supply flow as long as required*

Clearly, the short-term Air Force transformation efforts, such as the development of Task Force CONOPS and the Innovation Process, will be the starting point for Air Force transformation. Today's investments in S&T development through innovation via ACTDs and experimentation will naturally lead to further areas of investigation. However, the best linkage between these near- term efforts and the LTCs are the core competencies from the *Air Force Vision 2020*, as they describe the mid-point of the overall transformation path from today through 2050.

A. Finding and Tracking

The purpose of **Finding and Tracking** challenge is to provide the decision-maker target-quality information from anywhere in near real-time, which supports the core competency of Precision Engagement. To achieve this, the Air Force will focus on capabilities that provide **Pan-Spectral Awareness** for strategic awareness of worldwide battlespace; **Reliable Assessment and Monitoring** to provide continuous knowledge of assets; **Precise Fixing** to locate and identify targets in space and time for engagement support; **Sensor Placement and Sustainment** to have the right sensor in the right place at the right time; and **Information Systems** to have the right information to the right place at the right time. The Air Force has initiated several programs to develop its ability to find and track targets, to include efforts to build hyperspectral-imaging sensors that will allow ISR platforms to detect camouflaged or concealed targets. The Affordable Moving Surface Target Engagement system, currently being developed by the Defense Advanced Research Projects Agency, will provide the ability to track and kill ground moving targets more easily by passing data between ISR and strike aircraft through a real-time network.

B. Command and Control

The long-term challenge of **Command and Control** is to monitor, assess, plan, and direct air, surface, information, and space operations anywhere from multiple locations in near real-time, across the spectrum of operations and

levels of command, in support of the core competencies of Air and Space Superiority and Information Superiority. This LTC will require capabilities to **Monitor Global Conditions and Events** with constant awareness of all relevant red, blue, and gray situations; **Assess Global Conditions and Events** to understand and project behavior and intent of all red, blue, and gray elements, integrated seamlessly with planning and execution; **Plan Military Operations** to continuously shape any dynamic situation through agile, effects-based combat and combat support planning across the full spectrum of operations; **Execute Military Operations** through rolling execution at all levels with continuous feedback and feed forward, combining both precision and speed; and **Global Enterprise Integration** to provide capability for collaboration and movement and sharing of information for decision makers.

C. Controlled Effects

The purpose of the **Controlled Effects** long-term challenge is to create precise effects rapidly, with the ability to retarget quickly, against complex target sets anywhere, anytime for as long as required, in support of the core competencies of Air and Space Superiority, Precision Engagement, and Information Superiority. The capabilities required to meet this challenge are **Measured Global Force Projection,** which will exploit electromagnetic and other non-conventional means to achieve worldwide force projection; **Controlled Personnel Effects** to make selected adversaries think and act according to our wishes at useful military ranges; and **Dominant Remote Control** of an enemy's vehicles, sensors, communications, and information systems. The vision of Controlled Effects is to tailor and deliver the appropriate type and amount of energy on targets of military significance—be it equipment, personnel, or information systems—to create the desired effect, whether non-lethal, lethal, precise, or dispersed.

D. Sanctuary

The goal of the **Sanctuary** long-term challenge is to protect the Total Force from natural and man-made hazards or threats, allowing the Air Force to operate anywhere with the lowest risk possible, thereby directly supporting the core competency of Air and Space Superiority. To meet this challenge, the Air Force will require **Decisive Awareness** to collect the right information to eliminate surprise; **Knowledge Processing** to rapidly understand the exact nature of risks; **Invulnerable Force Design** to produce a force that is highly resistant to attack; and **Rapid Reconstitution** to rapidly recover, reconfigure, and replenish physical assets. Additionally, the Air Force will need to generate sanctuary for coalition forces anywhere, anytime and to sustain this for as long as required while denying the same to the adversary.

E. Rapid Air and Space Response

The long-term challenge of **Rapid Air and Space Response** is to respond as quickly as necessary to support peacetime operations or crises and relocate rapidly, if needed, in support of the core competencies of Global Attack and Rapid Global Mobility. The required capabilities to address this challenge have been identified as **Rapid Global Reach** with 24/7 stealth to defeat an adversary's anti-access capability; **On Demand Space Surge** to provide timely space support for military operations; and **Air and Space Power Network** for high energy fuels and efficient electrical power generation.

F. Effective Air and Space Persistence

The goal of the **Effective Air and Space Persistence** long-term challenge is to sustain the flow of equipment and supplies as well as the application of force for as long as required, in support of the core competency of Agile Combat Support. The capabilities required are **Space Awareness and Control,** including the ability to control all areas of space whenever necessary; **Space Access and Operations**, ensuring the US ability to capitalize on space's tactical and strategic advantages; and **Airlift and Tankers** to deploy and sustain warfighters from CONUS.

Science and Technology Investment

The 2001 Air Force Science & Technology Planning Review took an unconstrained look at the entire Air Force S&T program and produced estimates of the required funding levels needed to meet all of the identified long-term challenges and short-term objectives, within the specified timelines. An important conclusion was that research and development funding can only be used to affect the timescales for delivery of new S&T within certain limits.

Although funding may be used to "buy down" the total development time, there will always be a lower limit on the time required to advance any particular S&T area. If funding is reduced, the same advancement may occur, but over a longer period. Thus, in addition to selecting which areas to fund, it is also necessary to find a balance between accelerating and delaying developments in those areas, based on operational priorities.

VIII. CONCLUSION

The Air Force Chief of Staff established a vision of the future Air Force: *America's Air Force Vision 2020: Global Vigilance, Reach and Power*. It provides the foundation for building the "Task Force Concepts of Operation," which serve as the focus for transforming our planning, programming, budgeting, requirements, and acquisition processes and describes how the Air Force tailors forces and employs them in a variety of real-world scenarios. These Task Force CONOPS will help identify required capabilities, both transformational and non-transformational, which will facilitate the identification of specific programs to receive priority in resource allocation decisions. This initial Air Force Transformation Flight Plan explains this process and articulates the resulting capabilities and programs that comprise the ongoing transformation of the Air Force.

These transformational capabilities, as detailed in Chapter V and organized under the relevant Air Force core competency, include:

Information Superiority:

- Machine-to-machine interface of C4ISR systems through the horizontal integration of manned, unmanned, air, surface, information and space systems to provide executable, decision-quality knowledge to the commander in near real-time from anywhere, thereby enabling force application in single-digit minutes from the decision to engage
- Reliable, secure bandwidth and global data link integration on all air, surface, information and space platforms, with fusion to provide the commander a clear, coherent, real-time picture of the battlespace
- Real-time, deep-look, target-quality information anywhere on earth, providing continuous battlespace surveillance, enabling 24/7 time critical targeting and predictive battlespace awareness
- Ensured use of information domain via defensive IW
- The ability to deny adversary these same capabilities via offensive IW

Air and Space Superiority:

- *Overcoming Enemy Air Defenses:*
  - The ability to conduct 24/7 stealthy operations to gain access to a hostile area to clear the path for joint follow-on forces
  - The ability to conduct effective and persistent air-to-ground operations beyond the range of enemy defenses under adverse weather conditions, 24/7
  - The ability to destroy high risk, high priority, time-sensitive targets with minimal risk to friendly forces

- *Space Superiority:*
  - The ability to protect vital space assets
  - The ability to deny an adversary access to space
  - The ability to launch and operate space vehicles responsively

- *Missile Destruction in Flight:*
  - The ability to detect ballistic missile launches and airborne cruise missiles and destroy either of them in flight

Precision Engagement:

- The ability to conduct high volume attacks with fewer platforms
- The ability to achieve specific, tailored effects on a target, short of total destruction

Global Attack:

- The ability to conduct persistent air strikes against any target anytime, anywhere in the world in a timely manner

Rapid Global Mobility:

- The ability to rapidly establish an air-bridge, move and sustain military capability in support of world-wide combat and humanitarian relief contingencies, including areas with unprepared and/or contaminated airfields

Agile Combat Support

- The ability to deploy with a significantly reduced forward support footprint

The Air Force has robust strategic planning and innovation processes in place to support the development of transformation capabilities. At the same time, the Air Force is transforming its culture. It is investing in a complete restructuring of officer development through the DAL initiative and is institutionalizing the deliberate growth of leadership skills necessary to optimize air and space power. It has also reorganized into AEFs, which has dramatically changed the Service to a CONUS- and capabilities-based force sufficiently flexible to conduct a wide range of operations throughout the world. In addition, through the Future Total Force effort, the Air Force is experimenting with new ways to maximize its combat capability through innovative organizational constructs that maximize the use of the Air Reserve Components. Finally, the Air Force has a rigorous process to explore its S&T needs and goals beyond the *Air Force Vision 2020* timeframe to seek out leap-ahead transformational technologies.

Putting It All Together…

The ongoing transformation of the Air Force will significantly enhance its ability to address the anticipated security environment and exploit the current information revolution to dramatically improve the ability to conduct warfare. Currently, legacy aircraft are becoming more vulnerable to improving modern IADS and fighters; defeating an adversary often requires amassing forces in order to win by attrition; only a handful of specialized aircraft enjoy the revolutionary advantages of stealth and, then, only at night; it is very difficult to strike anywhere, anyplace in a timely manner—indeed, it can take days; striking an adversary usually requires subjecting aircrews to enemy fire; military operations are hindered by untimely, stove-piped C4ISR; achieving persistent ISR is frequently not possible; military leaders usually lack an accurate, clear picture of the battlespace; critical information and space systems are vulnerable to attack; the U. S. often cannot persistently strike targets in adverse weather at the time and place of its choosing; attacking targets persistently often requires heavy forward presence; in most cases, the only option to affect a target is to destroy it with bombs; it is difficult to rapidly deploy forces abroad in a timely manner; and American territory and its forces are highly vulnerable to ballistic and cruise missile attacks.

The ongoing Air Force transformation will resolve these shortfalls by enabling the United States to:

- *Use precision information and selective strike to achieve the effects of mass without massing forces*
- *Achieve air superiority against rapidly improving air defenses—to include double digit SAMs--24/7 to clear the path for follow-on forces*
- *Achieve persistent ISR*
- *Gain an accurate, clear common operating picture of the battlespace*
- *Ensure that the right information gets to the right place at the right time*
- *Persistently strike targets 24/7 anywhere, anyplace, anytime in all weather with minimal collateral damage or forward presence and without being subject to enemy fire*
- *Protect critical information and space systems while disrupting and/or destroying those of an adversary*
- *Execute EBO to generate the desired effects on a target other than destruction*
- *Rapidly deploy and sustain operations abroad*
- *Defeat airborne ballistic and cruise missiles*

In turn, the ongoing Air Force transformation will:
Help achieve interoperable, horizontally integrated Joint C4ISR

- *Enable operations in anti-access/area-denial and urban environments*
- *Counter emerging capabilities which challenge the ability to maintain space superiority*
- *Address the joint and coalition environment*

- *Rapidly move and sustain combat forces anywhere, anytime*
- *Deny sanctuary to our adversaries while protecting our forces and civilians*
- *Greatly reduce friendly casualties and collateral damage*

The Air Force wants its transformation vision to complement those of the other Services and DoD. Service-oriented transformational initiatives must ultimately become joint initiatives that provide greater effectiveness for the warfighter. The Air Force is using the Secretary of Defense's construct, expressed by the new defense strategy, FY03-07 DPG, the QDR and its six operational goals for transformation and risk framework to guide its transformation efforts. Indeed, as the AFTFP discusses, ongoing Air Force Transformation strongly supports the QDR's six critical operational goals of transformation. The Air Force will continue to work with all the Services, OSD, and the Joint Staff to keep transformation focused and provide the air, surface, information and space capabilities required for the Nation in a changing security environment well into the 21st Century.

Acronyms

ABA	Adaptive Battlespace Awareness
ABL	Airborne Laser
ACC	Air Combat Command
ACTD	Advanced Concept Technology Demonstration
ADS	Active Denial System
AEF	Air and Space Expeditionary Forces
AEFB	Air and Space Expeditionary Force Battlelab
AEHF	Advanced Extremely High Frequency
AFV	Armored Fighting Vehicle
AFCIS	Air Force Capabilities Investment Strategy
AF/XOH	Directorate of Homeland Security
AFSAA	Air Force Studies and Analysis Agency
AFSCN	Air Force Satellite Control Network
AFSP	Air Force Strategic Plan
AFTFP	Air Force Transformation Flight Plan
AIA	Air Intelligence Agency
AMB	Air Mobility Battlelab
AOC	Air and Space Operations Center
AOR	Area of Responsibility
ARC	Air Reserve Component
ASCM	Advanced Standoff Cruise Missile
ATD	Advanced Technology Demonstration
ATL	Advanced Tactical Laser
ATR	Automated Target Recognition
ATT	Advanced Theater Transport
AWACS	Airborne Warning And Control System
AWS	Advanced Wideband System
C/NOFS	Communication/Navigation Outage Forecasting System
C-NBC	Counter-Nuclear, Biological, and Chemical
C2	command and control
C2B	Command and Control Battlelab
C2ISR	command, control, intelligence, surveillance, and reconnaissance
C4	Command, Control, Communications, & Computers
C4ISR	Command, Control, Communication, Computer, Intelligence, Surveillance, and Reconnaissance
CAOC-X	Combined Air and Space Operations Center Experimental
CBRNE	Chemical, Biological, Radiological, Nuclear, High-Yield Explosive
C-BW	Counter-Biological Warfare
C-CW	Counter-Chemical Warfare
CEASE II	Compact Environmental Anomaly Sensor II
CFACC	Combined Force Air Component Commander
CITS	Combat Information Transport System
CONOPS	Concept of Operations; Concepts of Operation
CONUS	Continental United States
CRRA	Capabilities Review and Risk Assessment
CRUs	Contingency Response Units
DAL	Developing Air and Space Leaders
DCGS	Distributed Common Ground System
DE	Directed Energy
DEAD	Defeat Enemy Air Defense
DoD	Department of Defense

DOTMLPF	doctrine, organization, training, materiel, leadership and education, personnel, and facilities
DPG	Defense Planning Guidance
DTIG	Deployable Theater Information Grid
EAGLE	Evolutionary Aerospace Global Laser Engagement
EBO	Effects-Based Operations
EELV	Evolved Expendable Launch Vehicle
EMP	Electromagnetic Pulse
EO	Electro-Optical
ESM	Electronic Surveillance Measures
EW	Electronic Warfare
F2T2EA	Find, Fix, Track, Target, Engage and Assess
FOC	Full Operational Capability
FPB	Force Protection Battlelab
FSS	Future Strike System
FTF	Future Total Force
FYDP	Future Years Defense Program/Plan
GBL	Ground Based Laser
Gbps	gigabits per second
GCSS	Global Combat Support System
GIG	Global Information Grid
GMTF	Global Mobility Task Force
GPS	Global Positioning System
GPS/INS	Global Positioning System/Inertial Navigation System
GRTF	Global Response Task Force
GSTF	Global Strike Task Force
HDBTs	hardened and deeply buried targets
HIS	Hyperspectral Imaging Spectroscopy
HLSTF	Homeland Security Task Force
HPM	High Power Microwave
HSSW	Hypersonic Standoff Weapon
HUMINT	Human Intelligence
HUMRO/NEO	Humanitarian Relief Operations/Non-Combatant Evacuation Operations
IADS	integrated air defense systems
ICBM	Intercontinental Ballistic Missile
IMINT	Imagery Intelligence
IHAD	Interagency Homeland Air Defense
IO	Information Operations
IOC	Initial Operational Capability
IOIC	IO Integration Course
IR	infrared
ISR	Intelligence, Surveillance, and Reconnaissance
IT	Information Technology
ITV	In-transit Visibility
IW	Information Warfare
IWB	Information Warfare Battlelab
IWF	Information Warfare Flights
JASSM	Joint Air to Surface Standoff Missile
JASSM-ER	Joint Air to Surface Standoff Missile-Extended Range
JEFX	Joint Expeditionary Force Experiment
JFACC	Joint Force Air and Space Component Commander
JFC	Joint Force Commander
JSTARS	Joint Surveillance Target Attack Radar System
JTRS	Joint Tactical Radio System
LAIRCM	Large Aircraft Infrared Countermeasures
LCT	Laser Communication Terminal

LE	law enforcement
LEA	Law Enforcement Agency
LTC	Long-Term Challenge
M2K	Mobility 2000
MAJCOM	Major Command
MASINT	Measurement/Measuring And Signature Intelligence
MC2A	Multi-sensor Command and Control Aircraft
MC2AC	Multi-sensor Command and Control Aircraft and Constellation
MC2C	Multi-sensor Command and Control Constellation
MIJI	Meaconing, Interference, Jamming, and Intrusion
MILSATCOM	Military Satellite Communications
NORAD	North American Aerospace Defense Command
NCCT	Network Centric Collaborative Targeting
NPR	Nuclear Posture Review
NRTF	Nuclear Response Task Force
OEA	Operational Effectiveness Assessment
OPSEC	Operations Security
OSD	Office of the Secretary of Defense
PBA	Predictive Battlespace Awareness
PGM	precision-guided munition
PSYOP	psychological operations
QDR	Quadrennial Defense Review
RAIDRS	Rapid Attack Identification Detection and Reporting System
RF	Radio Frequency
RMA	revolution in military affairs
S&C4ISRTF	Space and Command, Control, Computers and Communications Intelligence, Surveillance and Reconnaissance Task Force
S&T	Science and Technology
SAM	Surface-To-Air Missile
SB	Space Battlelab
SBIRS	Space Based Infrared System
SBL	Space Based Laser
SBR	Space Based Radar
SDB	Small Diameter Bomb
SEAD	Suppress Enemy Air Defense
SIAP	Single Integrated Air Picture
SIGINT	Signals Intelligence
SMV	Space Maneuver Vehicle
SOF	Special Operations Forces
SOV	Space Operations Vehicle
SSA	Space Situational Awareness
ST	Special Tactics
STOL	Short Take-Off and Landing
TBM	Theater Ballistic Missile
TCT	Time Critical Targeting
TCTF	Time Critical Targeting Functionality
TPFDD	Time Phased Force Deployment Data
TSSG	Transformation Senior Steering Group
UAV	Unmanned Aerial Vehicle
UCAV	Unmanned Combat Air Vehicle
USNORTHCOM	United States Northern Command
VFT	Value Focused Thinking
VTOL	Vertical Take-Off and Landing
WASAAMM	Wide Area Search Autonomous Attack Miniature Munition
WMD	Weapons of Mass Destruction